

THE

**INTERNATIONAL
RED RIVER
BOARD**



Twenty First Annual
Progress Report
October 2020



INTERNATIONAL
RED RIVER BOARD



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DE LA RIVIERE ROUGE

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Commissioners:

The International Red River Board is pleased to submit its Twenty First Annual Progress Report to the International Joint Commission.

Respectfully submitted,

A handwritten signature in blue ink, reading "Patrick Cherneski".

Patrick Cherneski
Co-Chair, Canadian Section

A handwritten signature in blue ink, reading "Karl Jansen".

COL. Karl Jansen
Co-Chair, United States Section

PREFACE

This report documents water quality trends and exceedances of objectives, effluent releases, and control measures for the Red River basin for the 2018 Water Year (October 01, 2018 through September 30, 2019). In addition, this report describes the activities of the International Red River Board during the reporting period October 01, 2019 to September 30, 2020 and identifies several current and future water quality and water quantity issues in the basin.

The units of measure presented in this report are those of the respective agencies contributing to this report.

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INTERNATIONAL RED RIVER BOARD DIRECTIVE

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COMMITTEE MEMBERSHIP LIST*

1.0 SUMMARY

1.01 Water Quantity and Water Quality

North Dakota - Streamflows for the Red River and its tributaries were at much above normal levels (>90 percentile) for the 2019/2020 winter, with some locations having record high winter streamflows. Winter was characterized by soil moisture levels that were much above normal, shallower frost depths, and snow water equivalent amounts that were near to above normal by March per the National Weather Service (NWS) Office in Grand Forks, ND. "Total precipitation (rain and snow-water) measured across the basin from September 1 through March 10 was 4-8 inches above the long-term normal for most of Red River Basin," NWS March 12, 2020, Spring Flood Outlook. Snowmelt runoff began in late March, progressing from south to north. Peaks in the upper Red River (south of Fargo, ND) occurred the first and second weeks of April as an initial snowmelt runoff peak was followed by a secondary peak caused by additional precipitation and melting. The peak progressed downstream, with the crest passing into Canada on April 18-19, 2020. Current (late May) Red River Basin river conditions vary, most locations are ranging from normal to above normal (25-90 percentile).

The Red River at Fargo (Figure 1) crested on April 1 with a provisional peak gage height of 28.23 ft. and streamflow of 11,800 cfs, providing the 17th highest peak for the 119 years of peak flow record. The annual exceedance probability (AEP) was 0.10 or a "10-year recurrence interval". The Red River at Grand Forks crested on April 10 with a provisional peak of 47.70 ft. and streamflow of 73,800 cfs, providing the 7th highest peak for the 139 years of peak flow record. The annual exceedance probability (AEP) was between 0.04-0.02 or a "25 to 50-year recurrence interval". A wet fall and spring snowmelt runoff combined to raise Devils Lake approximately 1.7 ft. with the current stage (late May) around 49.91 ft. Pumping from Devils Lake outlets has not yet begun for the year.

In the Red River Basin, the USGS Dakota Water Science Center works in cooperation with:

- U.S. Army Corps of Engineers,
- U.S. Bureau of Reclamation,
- International Joint Commission of the U.S. State Department,
- Manitoba Provincial Government,
- National Weather Service,
- North-Central River Forecast Center,
- Minnesota Department of Natural Resources,
- North Dakota State Water Commission,
- North Dakota Department of Health,
- U.S. Bureau of Indian Affairs, and
- Several water resource boards and districts; and other Federal, State and local water resources managers.

Data and information shared among the agencies and offices helps in flood mitigation, water regulation, and water resource planning.

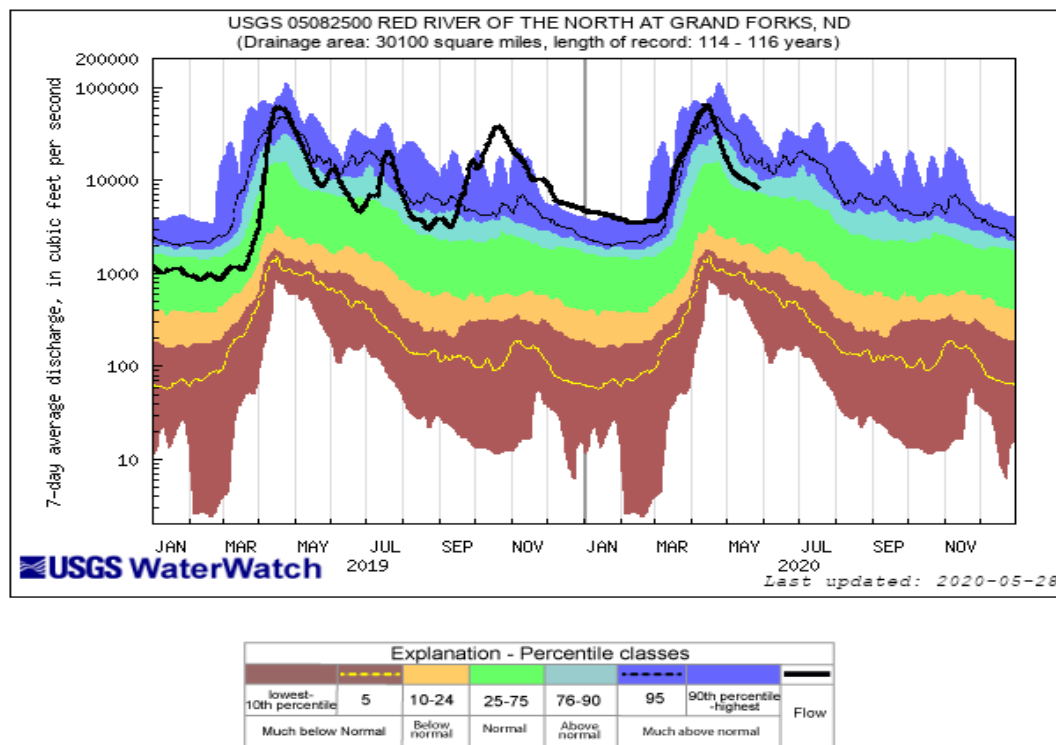


Figure 1: Red River at Fargo

Manitoba – Winter 2018/2019 - The Antecedent Precipitation Index is a model that indicates the amount of summer and fall rain (May to October) that remains in the soil layer and has yet to contribute to runoff. It is a model that indicates the degree of saturation in the soil and is used in Manitoba's flood forecasts. Heading into freeze-up the Antecedent Precipitation Index for the Red River Basin was generally normal to below normal. Soil moisture surveys showed soil moisture was generally normal for most of the basin and slightly above normal for the southern portion. Despite the drier summer weather in 2018, the fall precipitation was sufficient to increase soil moisture to normal in most areas.

Flows were in the normal range (25th to 75th percentile) for the winter of 2018/2019. Snow accumulations were normal to above normal in the Manitoba portion of the basin, and normal to well above normal in the US portion of the basin. The southern portion upstream of Fargo had significant snow accumulations.

The March 2019 Outlook published by Manitoba's Hydrologic Forecast Center estimated that the peak flow at Emerson could exceed the flow seen in the 2011 flood under favorable conditions, and exceed the 2009 flood under normal conditions. Under unfavorable conditions, the 2019 flow at Emerson was forecast to be second only to 1997 in the last 60 years of records.

Spring 2019

Snowmelt runoff began in late March progressing from south to north. Due to an unusually long and favourable thaw with minimal spring precipitation, flood peaks were lower than predicted in flood outlooks.

Peaks in the upper Red River occurred the second week of April and progressed downstream with the crest passing into Canada on about April 25. The Red River peaks at Fargo and Grand Forks were the 8th highest at both locations in over a hundred years of record and had an annual exceedance probability (AEP) for both locations of 0.04 or a "25-year recurrence interval".

- Provisional peak for the Red River at Fargo of 19,400 cfs at 35.03 ft. on April 8th.
- Provisional peak for the Red River at Grand Forks of 66,500 cfs at 46.99 ft. on April 11th.
- Provisional Devils Lake level this winter was around 48.2 ft. with lake levels this summer reaching a high of 49.1 ft. (daily value) on May 25. Current lake level is available at: http://waterdata.usgs.gov/nwis/uv/?site_no=05056500.

The observed peak at Emerson for the 2019 spring flood was approximately 60,700 cfs (1720 cms) and occurred on April 25. This is similar to the peak flow observed at Emerson in 2010. The 2019 peak flow measured at Emerson equated to a 1-in-15 year flood (Figure 2).

Due to the small contributions of tributaries in the Manitoba portion of the basin, the peak natural flood flow at James Avenue only equated to a 1-in-6 year flood. Red River Floodway operation began on April 14, and the gates were operated for 31 days ending on May 15. Approximately 580,000 acre-feet (715.4 million m³) of water was diverted around the City of Winnipeg by the Red River Floodway, with a peak flow of 14,400 cfs (407.7 m³/s). The recorded peak water level at James Avenue was 17.67 ft (227.15 m) under open water conditions on the morning of April 30. The peak natural flow at James Avenue in Winnipeg would have occurred at the same time, and was calculated to be approximately 64,660 cfs (1831.0 m³/s). This peak flow would have resulted in a James Avenue level of 21.41 ft (228.29 m). Operation of the floodway, Portage Diversion and Shellmouth Dam lowered the James Avenue water level during the peak natural flow by 3.74 ft (1.14 m).

Summer 2019

After the spring freshet the Red River gradually receded. Over the summer of 2019, flow was maintained or temporarily increased by summer rains, particularly in mid-July. Flows at Emerson remained above normal throughout the summer.

At the end of summer the U.S. Drought Monitor had a small area of abnormally dry and moderate drought in the Devils Lake area. The Canadian Drought Monitor had abnormally dry to moderate drought conditions in some areas of the basin, mostly on the west side of the river and north of Winnipeg.

Fall 2019

Manitoba and the U.S. portions of the Red River and the Souris River basins received well above normal precipitation in the fall, due to near record high precipitation in September and October. The first of three major storm systems struck the Red River Basin on September 20-21, with two to four inches (50 mm to 100 mm) of precipitation occurring across much of the basin. The second rainfall event occurred Sept 29-30, with another two to three inches (50 mm to 75 mm) of rain and a third and final storm dropped another two inches (50 mm) between October 10-12. The first two storms helped set a new September precipitation record for Grand Forks, with a total of 9.07 inches (230 mm) of rain – a departure of +7.02 inches (178 mm) above normal.

The record September precipitation resulted in unusually high streamflows for October, November and December. The high streamflows on the Red River in October combined with the threat of the October 10-12 precipitation event necessitated the operation of the Red River Floodway under Rule 4 to manage river levels within the City of Winnipeg and reduce the risk of basement flooding due to sewer backup. The floodway gates were operated for 29 days, ending on November 7, 2019. This represents, by far, the latest in the year that the Red River Floodway has ever been operated in its fifty years of existence.

The Red River at Grand Forks peaked on October 16, 2019, with a provisional peak gage height of 40.95 ft and a streamflow of 40,300 cfs, (1140 cms), the 27th highest peak for the 137 years of peak flow record. The Red River at Winnipeg peaked at 17.2 ft on October 23rd, breaking the previous October water level record by 4 ft.

Manitoba's Hydrologic Forecasting Centre's Fall Conditions Report for 2019 stated that heading into freeze-up soil moisture in most southern Manitoba basins is generally above normal to well above normal, with some areas showing record high soil moisture. All model results and various measurements confirmed that the Souris and Red River basins and the Whiteshell Lakes area were extremely wet, well above normal conditions.

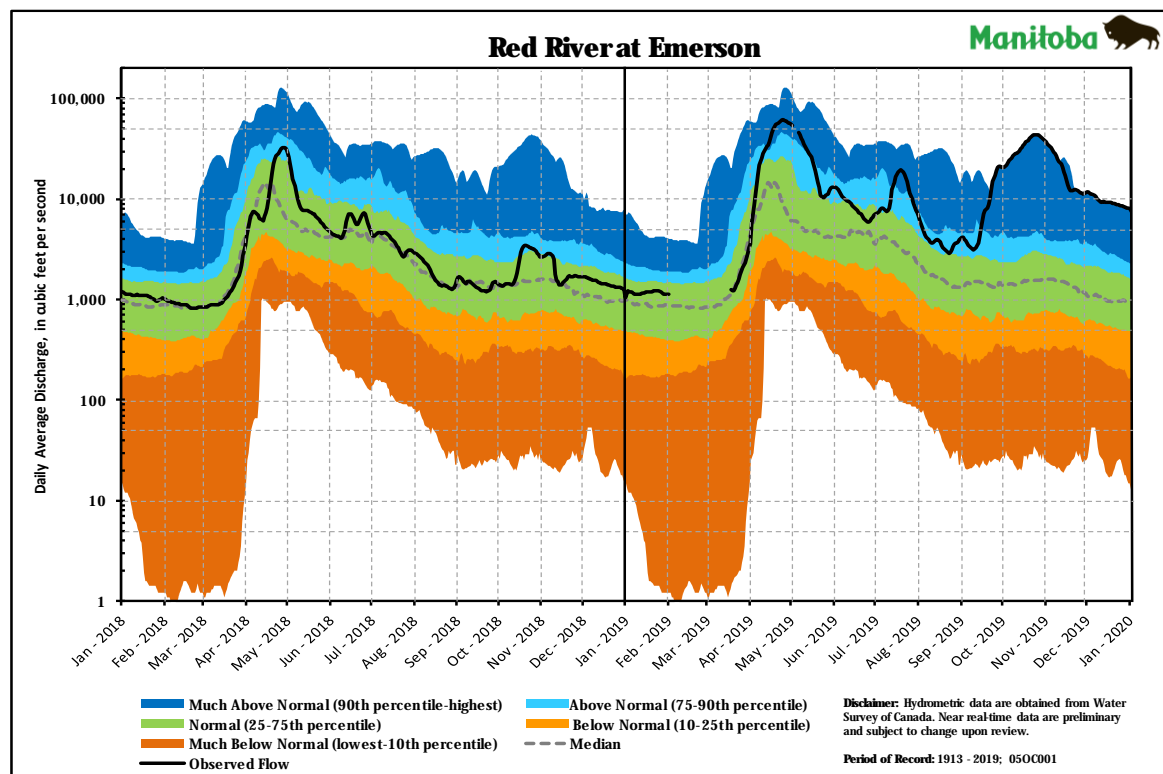


Figure 2. Average daily discharge in the Red River at Emerson for 2018 and 2019.

Water Quality

There are five water quality objectives established by the governments of Canada and the United States, herein called multi-national water quality objectives, for the Red River at the International Boundary. These parameters are - Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chloride (Cl), Sulphate (SO₄), and E. coli. Exceedances of the water quality objectives, and concentrations approaching the objective level for total dissolved solids (TDS) were observed at the international boundary during the October 1, 2018 - September 30, 2019 time period. Total Dissolved Solids (TDS) remained at or above the objective of 500 mg/L for most of the 2019 water year (70 %). The highest observed value of TDS was 888 mg/L on November 22nd.

Furthermore, the Sulphate objective (250 mg/L) was exceeded in 54% of the samples collected during the same period. The highest recorded value was 357 mg/L on July 9th.

The bacteriological characteristics of the Red River are assessed on the basis of observed *Escherichia coli* bacteria for which an IJC objective (200 colonies per 100 ml) has been defined. The presence of *Escherichia coli* in water is an indicator of impacts via human and/or animal wastes. During the 2018-2019 water year, the *Escherichia coli* bacteria objective of 200 colonies per 100 ml was not exceeded with a maximum count of 125 colonies per 100 ml on September 17, 2019.

1.02 International Red River Board Activities

As noted in the Preface, this report also describes the activities of the International Red River Board (IRRB) for the period October 01, 2019 - September 30, 2020, which succeeds the 2019 water year. The key activities are highlighted below:

In 2020, the IRRB further revised its 3-year work plan to reflect the status of its activities, and to affirm consistency with the International Watersheds Initiative and the IJC Directive to the IRRB. The work plan priorities include a continued effort to expand the existing scientific knowledge of aquatic ecosystem dynamics and current conditions. Key IRRB activities also include - development of apportionment/flow targets at the International Boundary including instream flow needs (IFN), continuation of the development of Comprehensive Flood Mitigation Strategy (CFMS) as per the terms of reference of the Committee on Hydrology (COH) and completion of nutrient objectives for the Red River at the International Boundary.

The IRRB coordinated two IJC public hearings – one in Fargo and another one in Winnipeg in 2020 held to seek public input on the recently completed nutrient concentration objectives and load targets that the IRRB recommended to the IJC.

Aquatic Ecosystems Committee (AEC) - The AEC also continued its Fish Telemetry study in the Red River Basin. Aquatic Invasive Species and Habitat Mapping were also included in the study, but were put on hold due to resource limitations.

Lower Pembina Task Team (LPTT) - The LPTT was revived in 2019 to complete its modelling work and recommendations to the Premier of Manitoba and Governor of North Dakota. LPTT is expected to reconvene its activities in the near future.

The IRRB held its summer bi-annual meeting on September 10-11, 2019 in Gimli, MB to address select issues in the basin. The winter bi-annual meeting was held on January 16-17, 2020 in ND (the meeting on January 17,

2020 was later postponed to February 13, 2020 via conference call due to extreme winter weather conditions). The meetings addressed water quality monitoring and compliance with the bi-national water quality objectives and established alert levels and IRRB work plan priorities. The latter included actions to develop apportionment procedures and instream flow needs (IFN), prioritized flood mitigation plans, and biological monitoring and follow-up of the new nutrient concentration objectives and load targets the Board recommended to the IJC in fall 2019.

1.03 International Red River Board Three-Year Work Plan (2018-2021)

The Board reviewed and updated its three-year work plan in September 2019. Current priorities include:

- Reporting on Water Quality Objectives,
- Comprehensive Flood Mitigation Strategy,
- Water Quantity Apportionment & Instream Flow Needs (IFN) including Fish Telemetry Project,
- Next Steps to Address the Lower Pembina Flooding Issues,
- Follow-up of Nutrient Objectives recommended to the IJC,
- Outreach and Engagement including Engagement of Indigenous & Metis People, and
- IWI funded Projects.

The current three-year work plan covers the period from October 1, 2018 through September 30, 2021.

2.0 INTRODUCTION

In April 2000, the International Joint Commission (IJC) formally merged its International Red River Pollution Board and International Souris-Red Rivers Engineering Board consolidating the water quality and water quantity responsibilities of the former boards, to form the International Red River Board (IRRB). This consolidation formalized the already emerging cooperative efforts of the former boards toward an integrated approach to transboundary water issues in the basin. Further, in its November 2000 report *Living with the Red*, the IJC recommended that the governments assign certain flood-related tasks to the IJC for implementation by its IRRB. In June 2001, Canada and the United States formally approved a new expanded directive for the IRRB. The directive is included in Appendix A.

In April 2003, the IJC requested further discussion with the IRRB on how to achieve a more ecosystem approach and a capacity to respond to the range of environmental and water-related challenges of the 21st century. In April 2004, the IJC adopted guiding principles aimed at broadening the partnership efforts of its international boards with other watershed entities for a more inclusive approach. The IJC refers to this effort as the International Watersheds Initiative. The various water management organizations in the Red River Basin appear receptive to the Initiative while at the same time recognizing the independent, impartial and objective role of the IJC and its boards in providing advice to governments. In June 2005, the IJC recommended that the governments of Canada and the United States confirm their support for the Initiative. The Red River basin is one of three pilot watersheds recommended by the IJC for implementation of the Initiative and for funding support.

In brief, the IRRB is responsible for assisting the IJC in avoiding and resolving transboundary disputes regarding the waters and aquatic ecosystems of the Red River and its tributaries and aquifers. This is accomplished through the application of best available science and knowledge of the aquatic ecosystems of the basin and an awareness of the needs, expectations and capabilities of residents of the basin. The geographic scope of the Board's mandate is the Red River basin, excluding the Assiniboine and Souris Rivers. The Poplar and Big Muddy basins were removed after consultation with the IJC. The Red River Basin is illustrated in Figure 3.

This report is the Twenty First IRRB annual progress report to the IJC.

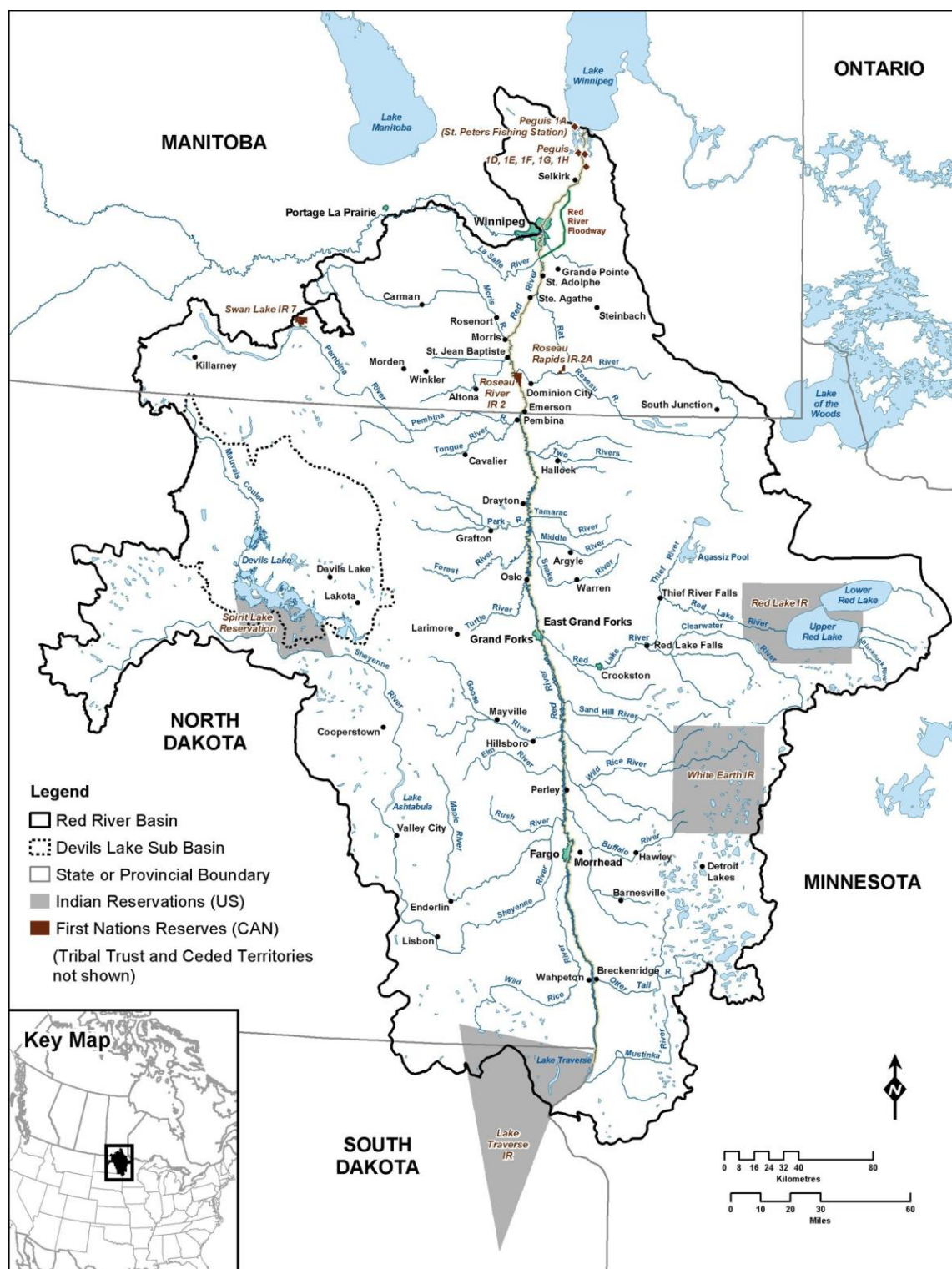


Figure 3: Red River and its Tributaries

3.0 INTERNATIONAL RED RIVER BOARD MEMBERSHIP

In its 1997 report *The IJC and the 21st Century*, the IJC proposed comprehensive international watershed boards as an improved mechanism for avoiding and resolving transboundary disputes. The intent was to broaden the scope of information upon which decisions relating to water and air are being made.

Through the continued integration of its water quality and water quantity responsibilities, and through efforts to increase stakeholder involvement, many of the goals of a comprehensive watersheds approach are being achieved by the International Red River Board. To facilitate these objectives, Board membership has been expanded to include non-government participation.

COL Karl Jansen, U.S. Army Corps of Engineers; and Patrick Cherneski Environment and Climate Change Canada, are the current Co-Chairs of the Board, respectively. Rebecca Seal-Soileau, US Army Corps of Engineers; and Girma Sahl, Environment and Climate Change Canada, provide secretarial, technical and engineering support to the Board.

United States

COL Karl Jansen – U.S. Chair

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U.S. Army Corps of Engineers

Jim Ziegler

Detroit Lakes Office
Minnesota Pollution Control Agency

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North Dakota Department of Health

Randy Gjestvang

North Dakota State Water Commission

Brian Caruso

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Ayn Schmit

U.S. EPA Region 8

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Gregg Wiche

U.S. Geological Survey, Water Science Centre,
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Nathan Kestner

Minnesota, DNR Division of Ecological and
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Rebecca Seal-Soileau - U.S. Secretary

U.S. Army Corps of Engineers

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Nicole Armstrong
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Gavin van der Linde
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Dr. Patricia Ramlal
Arctic and Aquatic Research Division
Fisheries & Oceans Canada

Girma Sahlu - Canadian Secretary
Transboundary Waters Unit
Environment and Climate Change Canada

4.0 INTERNATIONAL RED RIVER BOARD ACTIVITIES

During the reporting period October 01, 2019 - September 30, 2020, the International Red River Board met with the IJC at the fall semi-annual meeting at which Board priorities, activities and funding requirements were discussed. The Commissioners were apprised of basin developments and their potential transboundary implications.

4.01 Interim and Annual Board Meetings

The IRRB held its summer bi-annual meeting on September 10 -11, 2019 to address select issues in the basin, and the winter bi-annual meeting on January 16, 2020 and February 13, 2020 for a more complete review of its responsibilities, activities, and accomplishments. The meetings addressed water quality monitoring and compliance with the multi-national objectives and established alert levels, and IRRB work plan priorities. The latter included actions to develop water quantity apportionment procedures, instream flow needs, prioritized flood mitigation plans, and biological monitoring including the Fish Telemetry Project and recommendation of nutrient objectives to the IJC.

Except for short executive sessions during the September and January / February bi-annual meeting, both meetings were open to the public in a spirit of information sharing and collaboration. This was undertaken in recognition that there are many local, regional, state/provincial, federal and natural resource management entities operating in the basin with which connective links would be mutually beneficial. In addition to inviting presentations from interested groups, the public audience was invited to share its views. The Board initiated its first public session in conjunction with the Red River Basin Commission's (RRBC) Annual Conference in January 2015. RRBC provided a session in its conference agenda for IRRB Co-chairs and IJC Commissioners to answer questions and receive input from conference attendees. IRRB will continue to coordinate its public sessions with RRBC for future public meetings. This would allow the IRRB to reach a larger public audience than it would during its regular open house held at the end of its meetings.

4.02 IJC International Watersheds Initiative (IWI)

In 2004, the IJC adopted guiding principles aimed at broadening the partnership efforts of its international boards with other watershed entities for a more inclusive approach. The IJC refers to this effort as the 'International Watersheds Initiative'. The aim of the Initiative is to enhance the capabilities of existing IJC international boards while at the same time, strengthening cooperation among the various local entities. Building this capability includes¹:

- employing a broader, systemic perspective of the watershed;
- expanding outreach and cooperation among organizations with local water-related interests and responsibilities;
- promoting the development of a common vision for the watershed;
- developing a better hydrologic understanding of the water-related resources; and
- creating the conditions for the resolution of specific watershed-related issues.

There are many government, non-government, academic, private; and other entities with resource management responsibilities and interests in the Red River basin. Many have expressed support for a watershed approach. The present IRRB membership and Committee structures provide a linkage to key segments of this community with potential to expand the linkages as integrative approaches evolve.

¹ A Discussion Paper on the International Watersheds Initiative: Second Report to the governments of Canada and the United States under the Reference of November 19, 1998 with respect to International Watershed Boards, June 2005.

In its June 2005 report to the governments of Canada and the United States¹, the IJC recommended that the governments confirm their support for the Initiative and that funds be made available commensurate with board work plans. The Red River watershed is one of five pilot watersheds recommended by the IJC for implementation of the Initiative and for funding support.

4.03 Improving the Information Base to Address Transboundary Issues

The IRRB monitors water quality at the international boundary; maintains awareness of development activities basin-wide; provides a forum for the identification and resolution of water-related transboundary issues; recommends strategies for water quality, water quantity, and ecosystem health objectives, and; monitors flood preparedness and mitigation activities.

To effectively address this mandate a focused effort through the application of best available science and knowledge of the hydrology and aquatic ecosystems of the basin is required. Hence, in 2001 the Board established two committees, a Committee on Hydrology (COH) and the Aquatic Ecosystem Committee (AEC) under which access to expertise could be consolidated with the capacity to undertake specific investigations and tasks.

The COH was re-structured in 2006-2007 with a broader agency representation and new members. Specific activities assigned to the committees include establishing natural flow and water usage databases, evaluating current water quality monitoring and reporting protocols, developing biological monitoring strategies, and developing recommendations on an inter-jurisdictional drainage policy for the basin. These efforts are characterized by strengthened coordination with key water-oriented organizations in the watershed; and improved partnerships to develop a knowledge base and a shared understanding of water issues. Most frequently, the interests, objectives, and activities of the Committees intersect. Cross-membership also contributes to an integration of effort. Furthermore, the Board established a Water Quality Committee (WQC) in 2011 to report on water quality and nutrient management issues in the Red River Basin. The Board also created the Outreach and Engagement Committee (OEC) to improve communication between the Board and the various agencies that work with the IJC. In 2019, OEC was active in seeking and encouraging Indigenous and Metis People engagement and participation in Board meetings and activities.

4.03-1 Water Quality Monitoring at the International Boundary and Red River Basin

During the reporting period, Environment and Climate Change Canada continued to provide water quality monitoring at the international boundary and reported on the status of compliance with established Bi-national water quality objectives. This was augmented with reports on the presence of pesticides, herbicides and other chemical constituents for which alert levels have been established (reports summarized in Chapter 5).

IRRB also received information from agencies monitoring the status of water quality surveillance and water pollution control in their respective portions of the basin. The scope of this work and its significant contribution to the information base is described in Chapters 6 and 7.

4.03-2 Aquatic Ecosystem Committee

In 2003, the Aquatic Ecosystem Committee (AEC) prepared a conceptual framework to monitor the long-term aquatic ecosystem health of the watershed and an action plan outlining specific activities and resource requirements. The framework and action plan were endorsed by the Board and form the basis of the IRRB work plan. The overarching aquatic ecosystem health goal for the watershed, as articulated by the AEC, is to “assist in assuring that water resources of the Red River of the North basin support and maintain a balanced community of organisms with species composition, diversity and functional organization comparable to the natural habitats within the basin without regard to political boundaries”.

In January 2016, the AEC was expanded to include several new members at the state, provincial and federal level. The committee members are:

Patricia Ramlal: Canadian Co-Chair, Fisheries & Oceans Canada
Joanne Grady: US Co-Chair, U.S. Fish & Wildlife Service

Current Committee members are:

Luther Aadland

Todd Caspers (ND)

Eva Enders (CAD)

Amanda Hillman (MN)

Benjamin Holen (ND)

Geoff Klein (MB)

Nicholas Kludt (MN)

Aaron Larson (ND)

Jeff Long (MB)

Doug Watkinson (CAD)

Joshua Wert (ND)

The AEC holds monthly phone calls except during the spring/summer field season. The group’s discussion centers on how current work being done in the basin, linkages between ongoing programs and how the various programs could collaborate to get a better picture of the entire basin.

The AEC continues to flag the main issues of concern to the committee as those related to: (1) fish movement within the basin including instream flow needs (IFN); (2) aquatic invasive species (AIS); and (3) communication.

A large scale hydro-acoustic telemetry study is currently being conducted in the Red River and the adjunct Lake Winnipeg Basin to study habitat use and movement of a number of fish species including Lake Sturgeon (*Acipenser fulvescens*), Bigmouth Buffalo (*Ictiobus cyprinellus*), Channel Catfish (*Ictalurus punctatus*), Walleye (*Sander vitreus*), and Common Carp (*Cyprinus carpio*). Funding provided through a proposal accepted by the IWI is consistent with the International Red River Board (IRRB)’s

existing mandate to establish Instream Flow Needs Recommendations for the Red River as outlined in the work plan.

The telemetry study is planned to continue until 2022. Several students have made use of data generated from this project for their theses and there is tremendous interest from other researchers to access the data created by this project. Results have been presented at the American Fisheries Society meeting in Reno, Nevada, September 2019. The most recent publication is:

Enders, E.C., C. Charles, D.A. Watkinson, C. Kovachik, D.R. Leroux, H. Hansen and M.A. Pegg (2019) Analysing Habitat Connectivity and Home Ranges of Bigmouth Buffalo and Channel Catfish Using a Large-Scale Acoustic Receiver Network. Sustainability 11:3051 <https://doi.org/10.3390/su11113051>

The obtained information on habitat use and fish movement is crucial for Instream Flow Needs predictions and will provide previously unknown aspects of the lives of fishes in the Red River such as where certain fish spawn and when fish move to and from spawning grounds or overwintering areas. Additionally, we will better understand the population structure and movement of fish between the United States and Canada in the Red River Basin.

On October 8th, some members of the Committee on Hydrology (COH) met with a few local (Winnipeg) members of the AEC at the Freshwater Institute in Winnipeg. The goal was to have a discussion on work to be proposed by the COH on the Red River and whether or not the AEC had any concerns or could be supportive of that work. AEC had previously received the documents to be discussed. The proposal that they are considering putting forward by the January 2021 IRRB meeting is to do a bathymetric survey of the Red River. They still need to find out the level of resolution that can be done. The costs are estimated to be \$1K/river mile. The results are expected to be used in a 2D model for low flow in the Red using either HEC-RAS (USACE) or River 2D. The COH are looking for sources of funding including the International Watershed Initiative (IWI).

Follow-up questions:

1. Ask COH for details on methodology, sample stations, frequency, and how would they build in water use and availability.
2. What exactly is the survey trying/going to achieve?
3. The AEC would require more information:
 - a. Could you choose some reaches, not the entire river?
 - b. Should include locations behind the dams, such as at Grand Forks; areas where silt is being held.
 - c. Biological resolution of the current telemetry project is coarse, so even though there could be high resolution from the mapping exercise, we would have to average the movement data.
 - d. MN has questions about the LIDAR bathymetry from an ecological standpoint. What are the estimates on the lifetime usefulness of the data?
 - e. Saw the utility for sturgeon monitoring and looking for deeper habitats. The raw data will have applications, but not as clear how the model will be used.

The Aquatic Ecosystem Committee proposed a three-year work plan to the IRRB that met with their approval. We will be applying for IWI funds to support some of these activities. The three components of that plan are as follows:

1. Continuation of the Fish Movement Study: The large scale hydroacoustic telemetry study is currently conducted in the Red River and the adjunct Lake Winnipeg Basin to study habitat use and movement of a number of fish species. We have successfully solicited funds for the next three years, until 2022.
2. Aquatic Invasive Species: Evaluation of current and projected AIS in the Red River. It was agreed that the AEC should have a workshop as described in the work plan and will try to solicit funds to help with that. We will want to pull information from other agencies together before that workshop happens. This has been put on the back burner, but we are hoping to look into this further during 2020.
3. *From previous update, no change:* Habitat Evaluation in the Red River: Survey the riverine habitat in the Red River by conducting velocity and depth measurements along transects positioned at every hydroacoustic receiver site in the Red River using an ADCP (Acoustic Doppler Current Profiler). In addition, depth and substrate will be assessed using a BioSonics MX Aquatic Habitat Echosounder throughout the entire the length of the Red River. This study would be conducted by both countries (US and Canada) and would require approximately four weeks of field work and two months of data analysis. This work complements the fish movement study and the IFN study by the COH. Possibly add surveys of some of the tributaries, with ADCP if depths are deep enough, or with alternate survey equipment appropriate to the depths being surveyed. NOTE: This study has been postponed until fiscal 2020/21 due to the heavy workload of the participants. The AEC expects to submit a proposal to the IWI for ~\$30K CDN to assist in this study.

Potential additions to the workplan:

The AEC could be interested in participating in the Roseau River Habitat Restoration project and would be seeking Board approval to add that to the current workplan. The AEC would not be requesting IWI funds for any project until 2020 or 2021.

4.03-3 Water Quality Committee - Nutrient Management Strategy for the Red River Watershed

The formation of the Water Quality Committee was approved at the September 2011 International Red River Board meeting. The Committee has developing a Nutrient Management Strategy as endorsed by the Board.

The Water Quality Committee currently consists of the following members:

Jim Ziegler, Minnesota Pollution Control Agency (co-chair)
Nicole Armstrong, Manitoba Agriculture and Resource Development (co-chair)
Aaron Larsen, North Dakota State Department of Health
Ted Preister, Red River Basin Commission
Rochelle Nustad, U.S. Geological Survey
Kris Jensen, U.S. Environmental Protection Agency, Region 5
Iris Griffin, Environment and Climate Change Canada
Jason Vanrobaeys, Agriculture and Agri-Foods Canada
Michelle Harland, Environment and Climate Change Canada
Paul Klawunn, Environment Canada
Keith Weston, Red River Retention Authority

The Committee last met in August 2020.

Component One - Develop Nutrient Management Study Complete

Component Two - Develop a Shared Understanding of Jurisdictions' Nutrient Regulatory Frameworks and Identify Current Nutrient Reduction Actions, Activities and Plans for the Red River Watershed

Members of the committee and partners including the Red River Basin Commission hosted a Red River Basin/Cold Climate Agricultural Nutrients BMP workshop in Crookston, Minnesota in April 2019. Implementing agricultural beneficial management practices is critical to reducing nutrient runoff and improving water quality. Recent research suggests that the effectiveness of some BMPs in cold climates might differ from observations from areas south of the Red River Basin. The workshop included a review and exploration of available research on BMP effectiveness in northern climates to develop a consensus recommendation on BMP effectiveness. A final report on the workshop has been developed, final edits are being made and it is expected to be available in 2020.

Component Three - Recommend and Implement Nutrient Load Allocation and/or Water Quality Targets for Nutrients

The committee presented an updated report recommending nutrient objectives and targets for the Red River at the US-Canada border at the September 2019 board meeting. In December 2019, the IRRB recommended adoption of the targets and objectives to the IJC. Subsequently, the IJC held two public meetings and provided a public comment period. Following review of comments received, the IJC recommended adoption of the targets and objectives to the two federal governments in May of 2020. The WQC is unaware of any response from the two Governments at this time.

Component Four – Monitor and Report on Progress towards Meeting Water Quality Targets and Nutrient Load Allocations

International Watersheds Initiative – USGS Trend Analysis Project

The study has been completed and the report can be found at <https://doi.org/10.3133/sir20205079>

The abstract from the report:

A comprehensive study to evaluate water-quality trends, while considering natural hydro-climatic variability, in the Red River of the North Basin (basin) and assess water-quality conditions for the Red River of the North crossing the international boundary near Emerson, Manitoba, Canada (the binational site), was completed by the U.S. Geological Survey in cooperation with the International Joint Commission (through International Watershed Initiative), North Dakota Department of Environmental Quality, and Minnesota Pollution Control Agency and in collaboration with Manitoba Sustainable Development and Environment and Climate Change Canada.

In the study, water-quality data from State, Provincial, and Federal agencies in the United States and Canada for sites in the Red River of the North Basin from 1970 to 2017 were compiled and used for trend analysis. Trend analysis using a water-quality dataset from multiple agencies that collect water-quality data for various objectives presented multiple challenges. The trend-analysis approach was able to accommodate differences in water-quality data caused by field-collection and laboratory-analytical method differences, disparities in sampling frequencies, and spatial and temporal gaps in data.

Most of these challenges were overcome by the statistical tool, R-QWTREND, which identifies trends in concentration unrelated to variability in streamflow. The integrated basin approach used in the study, combined with comparing current data trends with historical trends, provided valuable insights into understanding how water quality is changing spatially (34 sites analyzed for a recent period, 2000–15) and temporally (5 sites analyzed for a 45-year historical period, 1970–2015) within the basin.

One of the most consistent spatial and temporal changes observed in the current study was increasing concentrations of sulfate among tributary and main-stem sites since 2000. For some sites, increases were detected starting as early as 1985. Total dissolved solids and chloride concentrations had spatial and temporal patterns like sulfate. Although R-QWTREND removes the variability in constituent concentration caused by natural streamflow variability, all variability in sulfate caused by hydroclimatic variability may not be captured because of changes in hydrologic pathways and changes in the contributions of sulfate from various natural sources.

Nutrient concentrations demonstrated less consistent spatial and temporal changes than sulfate, and changes in nutrient concentrations were assumed to be more closely tied to human-induced rather than natural changes. Nitrate-plus-nitrite concentrations were mostly increasing in the upper Red River of the North subbasin, and for nitrate plus nitrite and total nitrogen, the Sheyenne River subbasin had consistent decreasing concentrations.

Since 2000, total phosphorus has decreased in the upper Red River of the North subbasin, but total phosphorus concentration has increased for sites in the lower Red River of the North subbasin, and for some main-stem sites, concentrations have been increasing since 1985. Unlike sulfate, the pattern in historical trends for total phosphorus for the main-stem sites differed from tributary sites, indicating that human-induced changes affected tributaries and main-stem sites differently. The more detailed evaluation of flow-averaged water-quality conditions for the binational site provided an understanding of how loads have changed over time and what proportion of the year and season concentrations are expected to exceed

water-quality objectives. In a basin with highly variable streamflow like the Red River of the North, the trend in flow-averaged load (assuming streamflow conditions are the same year after year) provided a robust measure of change over time. Increasing concentrations of sulfate, chloride, total dissolved solids, and total phosphorus since 1985 for the binational site resulted in longer periods of exceedance of water-quality objectives per year occurring over time.

For total nitrogen, decreasing concentrations resulted in shorter periods of exceedance per year during 1980 to 2015, but concentrations were still expected to exceed the water-quality objective about half the year. Periods of when exceedances were likely to occur during the year were affected by the source and transport mechanisms of the constituent. Trend results from this effort identified how water quality has changed across the basin, and further investigation would help to identify causes for the trends observed here. Information from the current study provides a basis for future trend attribution studies, evaluation of water-quality objectives, and development of comprehensive strategies for reducing nutrients to desired targets and establishes a baseline for tracking future progress in the Red River of the North Basin.

Component Five - Facilitate ongoing technical, scientific and methodological dialogue and information sharing

This work is ongoing.

Component Six - Adapt the nutrient management strategy based on progress and ongoing evaluation.

This work is ongoing.

4.03-4 Water Quantity Apportionment

As indicated by the historic streamflow records, water supply in the Red River basin is highly variable seasonally, annually, and over longer time periods. Recent forecasts of water demand based on population and economic growth projections further test the adequacy and reliability of these supplies. Scientific opinion with respect to climate change provides added caution regarding future hydrologic trends and the prospect of greater instability in water supply in the region.

The factors noted above and projected increases in water use causing larger departures from the natural regime, prompt interest in establishing set flow targets at the international boundary. The IRRB considers it prudent to consider establishment of such targets before they are needed.

The Hydrology Committee's work on apportionment and international drought contingency planning is continuing and focussing on two components:

- 1) quantifying water usage and low flow vulnerabilities (municipal and other licensed water use, ecosystem instream flow needs, wastewater assimilation, etc.), and 2) quantifying low flow frequencies and the ability of U.S. reservoirs to deliver water during a drought to satisfy U.S. water demand and a potential low flow criteria at the border. The result of the study will be a better understanding of the risks the Basin faces from various Red River drought scenarios and how a drought contingency plan or minimum flow criteria for the Red River could reduce these risks.

A meeting was held with IJC technical staff on May 14, 2020 to provide an update on the low flow frequencies project planning. Since then, several data pieces required for constructing the model have been gathered. Soils and land use data, dam/water retention structure data, and watershed boundaries information at the HUC-12 scale is being gathered. Hydrological and meteorological data to be used in the model are

being evaluated. A literature search is being conducted for previous reports pertaining to streamflow and drought in the Basin.

The Hydrology Committee has updated its work plan with projects focused on obtaining more information of water usage and low flow frequencies. Two potential projects to be completed in the next two to three years include “Red River Low-Flow Frequency Analysis for Evaluation of Future Instream Flow Needs” and “Water Use in the Red River of the North Basin, United States and Canada, 1985-2015”.

4.03-5 Outreach and Engagement

The Outreach and Engagement Committee met several times during the year and renewed standing efforts on updating communication materials and participated in newer IJC initiatives for improving Website pages and most importantly Indigenous Engagement.

Key focus items include:

- Updating of IJC IRRB Brochure and Banner – a draft brochure is under development. The draft text has been finalized and submitted to co-chairs for their review before design and layout commences. The intent is to complete the brochure for use at future public events like Red River Basin Commission Annual Meeting. Thank-you to all committee members that contributed to the content.
- Updated banner(s) will be designed once the brochure has been completed (using some of the text from the brochure) in anticipation that these can also be finalized and printed prior to the January IRRB meeting.
- Updates are being made to the board’s website including updating the static watershed map, changes to the landing page and hiding pages that currently don’t have any updates or content.
- The committee also provided input on follow-up communication approaches related to the IJC’s support of the IRRB’s recommendations for nutrient objectives and targets for the Red River.
- Indigenous engagement –Canadian-based Indigenous governments and organizations including the Southern Chiefs’ Organization and the Manitoba Metis Federation (MMF) participated in the January meeting in Fargo. They have also confirmed their participation at the August meeting. The IJC is advancing Indigenous participation in and membership on boards more broadly and a draft strategy is under development.
- As the August IRRB meeting was virtual, there was no tour planned in conjunction with this year’s summer meeting.
- The public meeting in Fargo January of 2020 was during a pre-luncheon plenary session of the RRBC Annual Conference. There were approximately 50 people in attendance. Following the presentations there were no questions raised and one was submitted in writing following the session:
 - “Water management and land management are closely tied. What plan (beyond nutrient management) does the IRRB have to bring the concerns of land management into its remit and influence?”
- This public comment question relates in part to the status of the IRRB as a provisional rather than a full watershed board and the mandate directives.

4.04 Comprehensive Flood Mitigation Strategy

In its report *Living with the Red*, the IJC noted that there is no single solution to reduce, mitigate and prevent harm from future flooding, and that comprehensive, integrated, binational approaches must be pursued and implemented. The report follows with a list of recommendations to include, “Governments immediately take steps, on a binational basis, to begin development of a comprehensive flood damage reduction plan for the Red River basin”.

Since the 1997 Red River Flood, there has been a legacy of accomplishments in the areas of cooperation between jurisdictions, improvements in predictive tools, public involvement and changes in legislation and development of data dissemination tools. However, there are still challenges in improving the predictive tools, maintaining and improving databases, data collection and data dissemination, maintaining flood protection infrastructure and continued review of flood protection policy and legislation.

Living with the Red was updated in 2009 through the Hydrology Committee and a contract with Halliday & Associates to assess flood preparedness/mitigation and to identify gaps and tasks yet to be undertaken. The updated document entitled “How Are We Living with The Red?” informs the public of accomplishments and challenges regarding flood mitigation in the basin and supplements IRRB information available via the IJC International Red River web page.

The Hydrology Committee will also ensure the Board stays engaged about future plans and activities of the Red River Basin Commission as they update their Long Term Flooding Solutions (LTFS) document.

4.05 Lower Pembina River Flooding

The IRRB at its January 2008 meeting established the Lower Pembina Task Team (LPTT). The mandate of this Task Team was to develop a science-based solution(s) to mitigate flooding in the lower Pembina River Basin (Figure 4). A significant milestone for the IRRB was the completion of the LPTT Report. The LPTT has overseen the completion of a three- phased International Watersheds Initiatives (IWI) study report entitled, “Simulation of Flood Scenarios on the Lower Pembina River Flood Plains with the Telemac 2D Hydrodynamic Model”. All three phases of the study were conducted by the National Research Council (NRC). Based on the results of the modelling effort, the LPTT developed a document titled, “An exploratory analysis of mitigation measures for the lower Pembina River basin”. These LPTT reports from the three phases were then presented to the Board and subsequently accepted by the IJC. The reports, the model and animations have also been made public.

One of the recommendations provided by the IJC to Governments was to establish a Task Team to work towards a binational solution to help manage the flooding issues in the Pembina Basin. Based on this recommendation, the Governor of North Dakota and the Premier of Manitoba each assigned five members and created the Pembina River Task Team. IRRB Co-chairs have also been included as members of the Task Team in addition to the ten Task Team members. The committee was active from 2013 to 2015 and Committee meetings were facilitated by the Red River Basin Commission. The committee was working on recommendations to provide to the Governor and Premier but, the work has halted when the court case surrounding Pembina River flooding went to trial in the Federal Court of Canada.

In the interim, two additional phases of the Telemac 2D were completed to support the committee work. The additional modelling provided additional scenarios key to the committees work and to investigate culvert configurations for the potential raining on Hwy 18 near Nêche, ND.

After the judge ruled that the Canadian Federal Court did not have jurisdiction to hear the lawsuit, in June 2017 the Red River Basin Commission sent letters to North Dakota and Manitoba, requesting if there was

interest in re-engaging the Pembina River Basin Task Team. Both responded favorably and the committee has been re-established. Meetings were held in June 2019 in Gretna, MB, and in November 2019 in Pembina, ND. Additional meetings of the task team are anticipated. The Red River Basin Commission is facilitating the meetings. A summary of the history of the issues along the border, previous studies completed to analyze the problems and potential solutions, and the progress from the previous task team have been reviewed to date.

The National Hydraulics Centre developed a Pembina Interactive Visualization Tool in 2016/2017 to assist in viewing flood inundation areas for various scenarios modeled with the Telemac 2D model for the Lower Pembina River area. Various scenarios are shown and can be compared using a split screen visualization. The tool is available at: <http://pyla.canadacentral.cloudapp.azure.com:8080/>

Border Dike Lawsuit

An application for leave to appeal was submitted to the Supreme Court of Canada in August 2017. The applicants requested to appeal to the Canadian Federal Court and the Canadian Federal Court of Appeal concerning the determination that the Federal Courts do not have any jurisdiction to hear the issues concerning the border dike located near the Lower Pembina River. In December 2017, the Supreme Court of Canada dismissed the leave application for appeal of the Federal judge decision concerning whether the border dike lawsuit could be heard in Federal court.

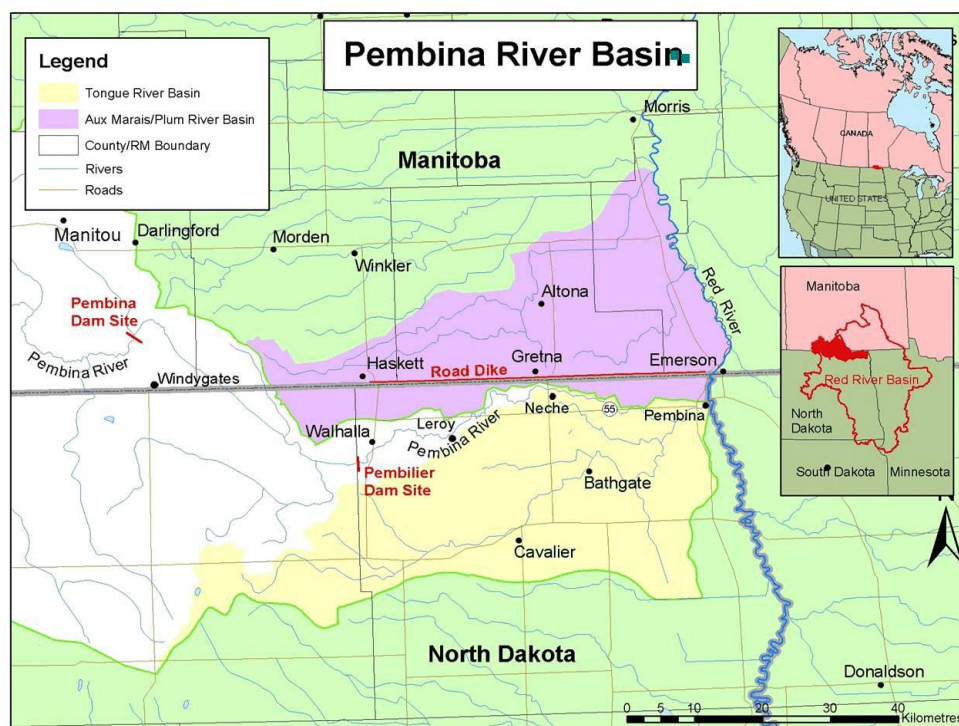


Figure 4: Pembina River Basin. The yellow and white areas comprise the Pembina River Basin.

5.0 WATER QUALITY AT THE INTERNATIONAL BOUNDARY

The water quality of the Red River at the Canada-US boundary, as reported herein, is based on continuous monitoring and instantaneous grab samples obtained during the 2018-2019 water year (October 1, 2018 - September 30, 2019). Data are used to determine compliance with the binational water quality objectives and alert levels at the boundary. Detection of exceedances of the objectives and alert levels serves as a trigger mechanism for the Board to report to the IJC and for the IJC to report to governments and also may lead agencies to take appropriate action to prevent or to mitigate potential problems, and to minimize the potential for reoccurrence. Environment and Climate Change Canada provides this monitoring service for the IRRB and maintains a permanent water quality and water quantity data collection site at Emerson, Manitoba.

The five parameters for which governments have approved objectives, as well as the suite of pesticides, metals and toxic substances which the Board uses as alert levels, are discussed below along with streamflow and pH for a corresponding time period. Water quality characteristics at other locations throughout the basin are referenced in subsequent chapters of this report to provide a more complete spatial representation of water quality and aquatic ecosystem conditions in the Red River basin.

5.01 Binational Water Quality Objectives for the Red River at the International Boundary

The IJC recommended the establishment of water quality objectives for a limited number of variables at the International Boundary on April 11, 1968, and the recommendation was approved by governments on May 4, 1969. These variables include: dissolved oxygen, total dissolved solids, chloride, sulphate, and Fecal coliform bacteria. *E. coli* replaced Fecal coliform as a water quality objective on October 1, 2010. In addition, the IJC established a number of alert levels for a suite of pesticides, metals and toxic substances. The IRRB is responsible for monitoring and reporting on compliance with these objectives and alert levels.

Several exceedances were observed during the 2018-2019 water year, as summarized in Table 1, below. Additional detail on each parameter is provided in the following sections.

| Table 1 International Red River Board Water Quality Objectives Summary of Exceedances Red River at the International Border Oct. 2018-Sept.2019 Water Year | | | | |
|---|--------------------------|--------------------------------|------------------------|-----------------|
| Parameter | Objective | Exceedances | | Maximum (Date) |
| | | Number (total # samples) | % samples exceeding | |
| Dissolved Oxygen | >5 mg/L | 2 (47) | 4 | 4.27 (Jul 16)** |
| Total Dissolved Solids | 500 mg/L | 32 (46) | 70 | 888 (Nov 22) |
| Chloride | 100 mg/L | 1 (46) | 2 | 108 (Oct 15) |
| Sulphate | 250 mg/L | 25 (46) | 54 | 357 (Jul 9) |
| <i>E. coli</i> | <200 colonies /100 ml | 0 (18) | 0 | 125 (Sept 17) |

**Minimum value for Dissolved Oxygen

Dissolved Oxygen

Observed levels fell below the objective of 5 mg/L twice in July during the 2018-2019 water year. Minimums often occur when discharge increases following significant rain events.

Total Dissolved Solids

Total Dissolved Solids (TDS) remained at or above the objective (500 mg/L) for most of the reporting period, with the exception of during the spring (Figure 5). This pattern has been consistent over the last number of years, with higher flows resulting in additional dilution. Exceedances were observed in 70% of the samples collected in the 2018-2019 water year. The highest observed value of 888 mg/L occurred on Nov. 22, 2018.

Chloride

The chloride objective (100 mg/L) was exceeded once during this reporting period. The maximum concentration was 108 mg/L on Oct 15, 2018.

Sulphate

The sulphate objective (250 mg/L) was exceeded in 54% of the samples collected in the 2018-2019 water year (Figure 6).

E. coli

Observed *E. coli* bacteria counts, as shown in Table 1, remained below the objective of 200 / 100 mL during the reporting period.

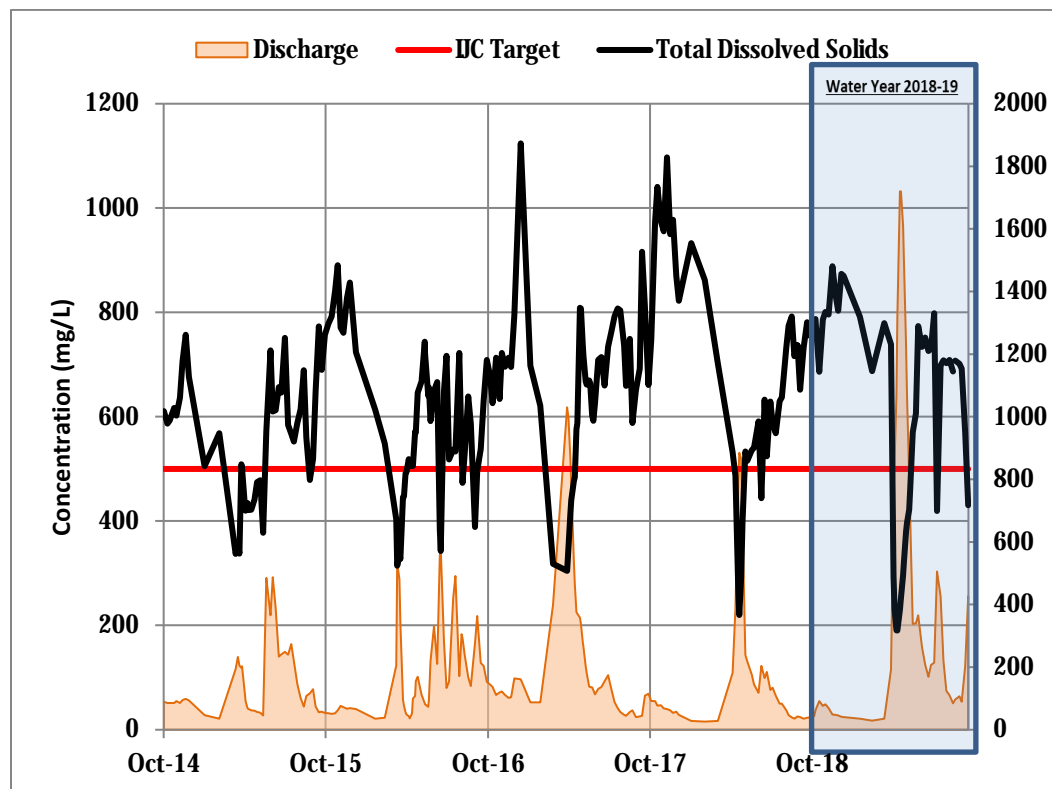


Figure 5: Total Dissolved Solids (TDS) - Red River at the International Boundary

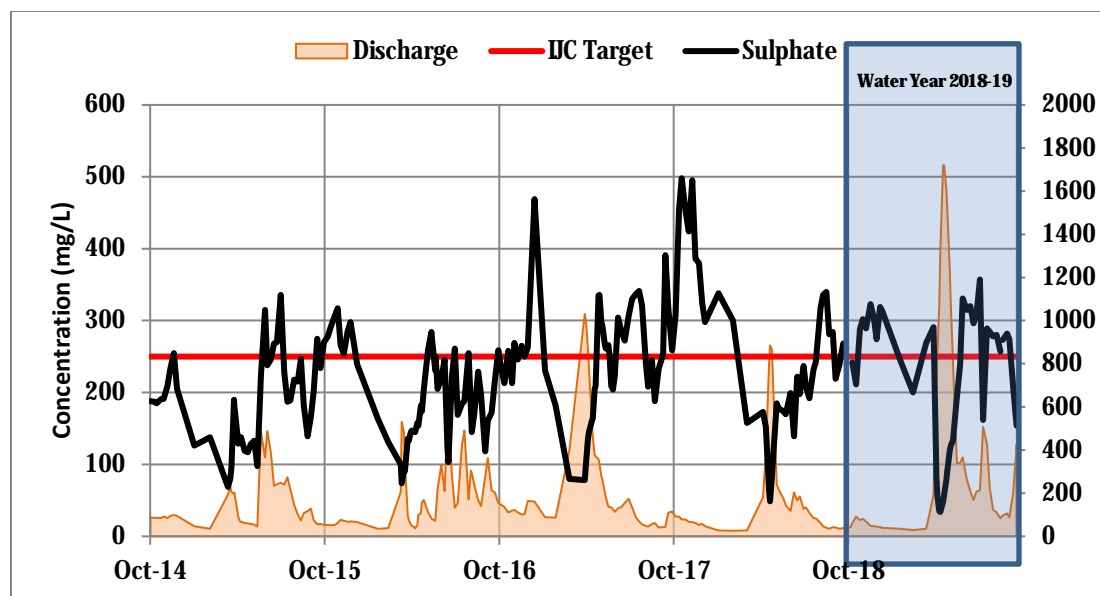


Figure 6: Sulphate levels - Red River at the International Boundary

5.02 Alert Levels

The former International Red River Pollution Board established alert levels for suites of pesticides, metals and toxic substances in 1986. For pesticides, the alert level is described as “not detectable in water”, while specific metals have concentration values for alert levels. The following table details the number of “alerts” detected by Environment and Climate Change Canada (Water Quality Monitoring and Surveillance Division) during the reporting period (Table 2).

Pesticides

Based on a total of up to 14 water samples, sixteen (16) pesticides and metabolites with alert levels (greater than detection concentration) were observed during the October 1, 2018 - September 30, 2019 reporting period. Nine (9) compounds (Atrazine, 2, 4-D, Clopyralid, Picloram, Metolachlor, Dicamba, MCPA, MCPP, Desethyl Atrazine) were detected in 70-100% of the samples. The detection levels for all compounds were below the Canadian Guidelines for the Protection of Aquatic Life. Given that the Red River basin is an agriculturally dominated region, the presence of pesticides is expected. The detection of banned pesticides (legacy contaminants) is not unusual given the slow bio-degradation rate of these chemicals. No legacy contaminants were detected during this reporting period.

Environment and Climate Change Canada recently enhanced the pesticide analyses to assess current use pesticide concentrations during open water conditions (May to October). Analyses have been expanded to include a broader range of pesticides including insecticides (neonicotinoids), herbicides (sulfonyl urea) and fungicide pesticides. In 2018-19, detections included 6 of 14 insecticides, 11 of 21 herbicides and 12 of 21 fungicides. The pesticides with the highest frequency of detection are summarized in Table 3. Of interest is the comparatively high result for Fomesafen (2500 ng/L, July). Fomesafen is a selective herbicide that may be applied pre-plant, pre-emergence or post-emergence for control or suppression of broadleaf weeds, grasses and sedges in soybeans and potatoes. A review of climatic conditions and the hydrograph indicate precipitation in the area in the 2 days preceding the sampling event. Recent application of the pesticide in the vicinity followed by precipitation can result in the higher concentrations being detected.

The IRRB continues to closely monitor trends in these concentrations and their frequency of detection with the intention to update its assessment as new scientific information becomes available. The IRRB recognizes that there is very little scientific information available to assess the implications of long-term exposure to low concentrations of pesticides and herbicides by aquatic organisms and humans.

Metals

A total of 45 water samples were collected and analyzed for metals and toxic substances during the reporting period. The highest numbers of exceedances were detected for cadmium, manganese and iron, with exceedance rates ranging from 84-100%. The maximum values for cadmium, manganese and iron were detected in April 2019. Zinc also exceeded the alert level for a few samples this year. It should be noted that the maximum measured concentration for all metals, with the exception of selenium and chromium, occurred during the spring freshet. Higher metals concentrations tend to correspond to higher flow and higher particulate matter events. Iron and manganese are components in natural soils. However, the detection of higher levels of cadmium may indicate anthropogenic sources.

Water Quality Monitoring Program at Emerson in 2019-2020

Environment and Climate Change Canada has increased the frequency of water quality monitoring on the Red River at Emerson, which continued into the 2018-19 Water Year. During the spring freshet, a minimum of two samples per week were collected with a weekly sampling frequency for the remainder of the open water season. Monthly sampling resumed during the winter.

A similar monitoring program was planned for 2019-2020. Due to the COVID-19 pandemic, ECCC has suspended all water quality monitoring operations since March 2020. Planning is underway for a resumption of field activity, but no firm date has been set. In the meantime, the province of Manitoba (Agriculture and Resource Development - ARD) has initiated water quality monitoring on the Red River at Emerson with samples collected monthly for general chemistry, nutrients, metals, and bacteria. Previous joint monitoring activities between ECCC and ARD should allow some, if not all, of the provincially collected data, to be used to estimate water quality conditions at the border and to report on exceedances.

Table 2 Exceedances of Alert Levels, Red River at International Boundary

October 1, 2018 to September 30, 2019

| Parameter | Units | Alert Level | Number of Samples | Number of Exceedances % | Maximum Exceedance Value (Month) | Canadian Environmental Quality Guideline |
|--------------------------|-------|-------------|-------------------|-------------------------|----------------------------------|--|
| Metals (total): | | | | | | |
| Cadmium | ug/L | Detect | 45 | 45 (100%) | 0.701 (Apr) | 0.37ug/L ¹ |
| Chromium | ug/L | 50 | 45 | 0 | -- | NG |
| Iron | ug/L | 300 | 45 | 38 (84%) | 12900 (Apr) | 300 ug/l ¹ |
| Manganese | ug/L | 50 | 45 | 38 (84%) | 1140 (Apr) | 200 ug/L ² |
| Selenium | ug/L | 10 | 45 | 0 | -- | 1 ug/l ¹ |
| Zinc | ug/L | 47 | 45 | 3 (7%) | 64.7 (Apr) | 30 ug/l ¹ |
| Toxic Substances: | | | | | | |
| Arsenic | ug/L | 10 | 45 | 0 | -- | 5 ug/l ¹ |
| Boron | ug/L | 500 | 45 | 0 | -- | 29 mg/l ¹ |
| Total PCB | ng/L | Detect | -- | -- | -- | NG |
| Pesticides: | | | | | | |
| 2,4-D | ng/L | Detect | 14 | 14 (100%) | 185 (Apr) | 4000 ng/l ¹ |
| Bromoxynil | ng/L | Detect | 14 | 8 (57%) | 75.1 (Jul) | 5000 ng/l ¹ |
| Clopyralid | ng/L | Detect | 14 | 14 (100%) | 1140 (Jul) | NG ⁵ |
| Dicamba | ng/L | Detect | 14 | 10 (71%) | 337 (Jul) | 10000 ng/l ¹ |
| Imazamethabenz-methyl a | ng/L | Detect | 14 | 0 | -- | NG |
| MCPA | ng/L | Detect | 14 | 12 (86%) | 14.4 (Jul) | 2600 ng/l ¹ |
| Mecoprop (MCP) | ng/L | Detect | 14 | 13 (93%) | 33.9 (Apr) | NG |
| Picloram | ng/L | Detect | 14 | 13 (93%) | 153 (Sep) | 29000 ng/l ¹ |
| g-Benzenhexachloride | ng/L | Detect | 7 | 0 | -- | 10 ug/l ¹ |
| Atrazine | ng/L | Detect | 14 | 14 (100%) | 947 (Jul) | 1800 ng/l ¹ |
| Desethyl Atrazine | ng/L | Detect | 14 | 12 (86%) | 269 (Jul) | NG |
| Metolachlor | ng/L | Detect | 14 | 14 (100%) | 3460 (Jul) | 7800 ng/l ¹ |
| P,P-DDE | ng/L | Detect | 7 | 0 | -- | NG |
| Alpha-Endosulfan | ng/L | Detect | 7 | 0 | -- | 3 ng/l ^{1,4} |
| Beta-Endosulfan | ng/L | Detect | 7 | 0 | -- | 3 ng/l ^{1,4} |
| Metribuzin | ng/L | Detect | 14 | 2 (14%) | 291 (Jul) | 1000 ng/l ¹ |

Notes:

1. Canadian Water Quality Guidelines for the Protection of Aquatic Life (<http://st-ts.ccme.ca/>)

2. Canadian Water Quality Guidelines for the Protection of Agriculture (<http://st-ts.ccme.ca/>)

3. Guideline value corrected for minimum value for hardness (mg/L CaCO₃) in the reporting period (<http://st-ts.ccme.ca/?lang=en&factsheet=93>)

4. Guideline value is for technical grade Endosulfan, which is a mixture of the two biologically active isomers (α and β)

5. NG = No guideline established

| Table 3 Detections of Current Use Pesticides, Red River at International Boundary October 1, 2018 to September 30, 2019 | | | | | |
|--|--------------|--------------------------|-----------------------|------------------------------|---|
| Parameter | Units | Number of Samples | Detections (%) | Maximum Value (Month) | Canadian Environmental Quality Guideline^{1,2} |
| <i>Fungicides</i> | | | | | |
| Metalaxyl | (ng/L) | 7 | 100 | 7.9 (Jun) | NG |
| Tebuconazole | (ng/L) | 5 | 100 | 27 (Aug) | NG |
| Azoxystrobin | (ng/L) | 5 | 100 | 33 (Aug) | NG |
| Boscalid | (ng/L) | 5 | 100 | 16 (May) | NG |
| <i>Insecticides (Neonicotinoids)</i> | | | | | |
| Imidacloprid | (ng/L) | 7 | 100 | 9.8 (Apr) | 230 ¹ |
| Clothianidin | (ng/L) | 7 | 100 | 38 (Apr) | NG |
| Thiomethoxam | (ng/L) | 7 | 100 | 25 (Jun) | NG |
| Chlorantraniliprole | (ng/L) | 7 | 71 | 1.2 (Jun) | NG |
| <i>Herbicides (Sulfonyl Ureas)</i> | | | | | |
| Chlorsulfuron | (ng/L) | 7 | 57 | 1.2 (Jun) | NG |
| Diuron | (ng/L) | 7 | 86 | 18 (Jul) | NG |
| Fomesafen | (ng/L) | 7 | 90 | 2500 (Jul) | NG |
| Flumetsulam | (ng/L) | 7 | 100 | 52 (Sep) | NG |
| Metsulfuron | (ng/L) | 5 | 100 | 2.3 (Jun) | NG |
| Tribenuron | (ng/L) | 5 | 100 | 1.5 (Sep) | NG |
| <p>1. Canadian Water Quality Guidelines for the Protection of Aquatic Life (http://st-ts.ccme.ca/)</p> <p>2. Canadian Water Quality Guidelines for the Protection of Agriculture (http://st-ts.ccme.ca/)</p> <p>3. NG = No guideline established</p> | | | | | |

6.0 WATER QUALITY SURVEILLANCE PROGRAMS

As described in Chapter 5, data collected at Emerson, Manitoba, are used to determine compliance with established Binational Water Quality Objectives at the international boundary. Chapter 6 contains basin-wide data and information contributed by federal, state and provincial agencies to provide a more complete spatial representation of water quality and aquatic ecosystem health conditions in the Red River basin.

U.S. Water Quality Standards Program

In the United States, the statutory basis for the current Water Quality Standards (WQS) program is the Clean Water Act. Under Section 303 of this Act, the Environmental Protection Agency (EPA) issued a Water Quality Standards Regulation (40 CFR Part 131). This regulation specifies the requirements and procedures for developing, reviewing, revising, and approving WQS by the States and Tribal Nations. EPA has approved WQS programs for the States of North Dakota, South Dakota, and Minnesota. No tribal programs in the Red River basin have yet been approved.

WQS define the water quality goals for a water body or portion thereof, by designating the use or uses to be made of the water, and implementation criteria for protecting each of those uses or areas. Additionally, a WQS program must include an anti-degradation policy to protect water quality that is already better than State standards. Designated uses for water bodies may include:

- Aquatic life - protection of fish and other aquatic organisms;
- Recreation - swimming, wading, boating, and incidental contact;
- Drinking water - protection for downstream public water supply intakes;
- Miscellaneous - industrial or agricultural uses, tribal religious uses, etc.

Water quality standards are designed to protect the beneficial uses associated with the standards. Based on the assessment of the water quality data and other relevant information compared to the standards for a given pollutant or water quality characteristic, the use may be:

- Fully supported
- Partially supported
- Threatened
- Not supported

6.01 Minnesota

This information in this report is from July 1, 2019 to June 30, 2020

Watershed Restoration and Protection Projects

There are 17 major tributaries to the Red River in Minnesota. The Minnesota Pollution Control Agency is developing watershed restoration and protection plans for each of these watersheds. Each project consists of monitoring, stressor identification, modeling, public participation/input and a TMDL. The WRAPs have been completed on ten watersheds, five reports are drafted and are under review, reports for the remaining two are under development.

Watershed Restoration and Protection Project

| Name | Status | Final WRAPS Approved |
|-----------------------------|--------------------------------|-------------------------|
| Bois De Sioux River | Complete & Approved | 4/8/2020 |
| Buffalo River | Complete & Approved | 4/9/2016 |
| Clearwater River | Reports under review | |
| Mustinka River | Complete & Approved | 9/26/2016 |
| Otter Tail River | Reports in Development | |
| Red Lake River | Complete & Approved | 11/20/2019 |
| Red R. - Grand Marais Creek | Complete & Approved | 4/11/2019 |
| Red R. - Marsh River | Reports under Review | |
| Red R. - Sandhill River | Complete & Approved | 4/13/2017 |
| Red R. - Tamarac River | Complete & Approved | 3/21/2019 |
| Roseau River | Reports under review | |
| Snake River (Red R. Basin) | Reports under review | |
| Thief River | Complete & Approved | 3/18/2019 |
| Two Rivers | Complete & Approved | 6/10/2019 |
| Upper Red River | Complete & Approved | 12/22/2017 |
| Upper/Lower Red Lake | Reports in Development | |
| Wild Rice River | Reports under Review | |

TMDLs are currently being written for the Red River main stem and are expected to be complete near the end of this calendar year (2020). Assessment work has been completed on the Red River main stem and the status report was released in January of 2019. The report can be viewed at <https://www.pca.state.mn.us/water/red-river-north-evaluating-its-health>

TMDLs with WRAPS were completed for two HUC 8 – Red Lake River and Bois de Sioux River

In the Red Lake river watershed, TMDLs were written for 12 impairments. Six (6) were for Total Suspended Solids (TSS) and six (6) were for bacteria impairments (E. coli). Complete details including the reaches addressed can be found in the Red Lake River TMDL report at this location: <https://www.pca.state.mn.us/sites/default/files/wq-iw5-17e.pdf>

In the Bois de Sioux river watershed, TMDLs were written for 16 impairments. Seven (7) were for TSS, seven (7) were for Total Phosphorus (TP), and two (2) were for bacteria (E.coli). Complete details including the reaches addressed can be found in the Bois de Sioux TMDL study report at this location: <https://www.pca.state.mn.us/sites/default/files/wq-iw5-12e.pdf>

There were 54 National Pollutant Discharge Elimination System (NPDES) permits issued. Ten of these were for industrial sites, one was a state park, the remainder were for wastewater treatment plants. There were 36 releases reported from NPDES permitted facilities,

6.02 North Dakota

Ambient Water Quality Monitoring Program

In May 2019, the North Dakota Department of Health's (NDDoH) Environmental Health Section transitioned to its own cabinet agency within the state. The Environmental Health Section separated from the NDDoH and became known as the North Dakota Department of Environmental Quality (NDDEQ). Within the NDDEQ, the Watershed Management Program is responsible for ambient surface water quality monitoring.

In 2012, the USGS North Dakota Water Science Center completed an analysis of the state's ambient water quality monitoring network, including the North Dakota Department of Environmental Quality's (NDDEQ) fixed station ambient monitoring network and the ND State Water Commission's (SWC's) High/Low flow network. In addition to evaluating trends, providing loading estimates and providing a spatial comparison of sites, the report, entitled "Evaluation of Water-Quality Characteristics and Sampling Design for Streams in North Dakota, 1970-2008" (<http://pubs.usgs.gov/sir/2012/5216/>), provided recommendations for a revised water quality monitoring network for rivers and streams in the state. These recommendations were made to ensure adequate coverage, both spatially and temporally, which is necessary to estimate trends, estimate loads and provide for general water quality characterization in rivers and streams across the state.

Beginning on January 1, 2013 and based on the recommendations provided in the USGS report, the NDDEQ, in cooperation with the USGS and the SWC, implemented a revised ambient water quality monitoring network for rivers and streams. The highest level of sites, design level 1, consist of a network of 32 basin integrator sites located across the state with 16 level 1 sites located in the Red River basin (Figure 7, Table 4). These sites are sampled 8 times per year, twice in April, once each in May, June, July, August, and October, and one time in the winter (January) under ice. The next level, design level 2, consists of 25 sites with 12 level 2 sites located in the Red River basin (Figure 7, Table 5). These sites are sampled 6 times per year, once each in April, May, June, August and October and once under ice during the winter (January). The lowest level of sites, design level 3, consists of 25 sites. There are 12 level 3 sites located in the Red River basin (Figure 7, Table 6). These sites are only sampled 4 times per year, once each in April, June, August and October. Under the current design, the USGS samples all of the design level 2 sites (with the exception of the Red River at Harwood which is sampled by the NDDEQ) and all the design level 3 sites. In the Red River basin, the NDDEQ samples 8 level 1 sites, while the USGS samples 8 sites.

At all level 1, 2 and 3 sites field measurements are taken for temperature, dissolved oxygen, pH and specific conductance. Sampling and analysis at all level 1, 2 and 3 sites consist of general chemistry, dissolved trace elements, and total and dissolved nutrients (Table 7). In addition to these water quality parameters, total organic carbon (TOC), dissolved organic carbon (DOC), total suspended solids (TSS), and E. coli bacteria are sampled and analyzed for at all level 1 sites (Table 7). E. coli bacteria are only sampled during the recreation season (May-September). In addition to sampling for these analytes, the Red River at Fargo, the Red River at Grand Forks, and the Red River at Pembina are sampled for total suspended sediment. The analysis of the total suspended sediment samples is conducted by the USGS Iowa Sediment Laboratory. All chemical analysis of samples is performed by the NDDEQ's Laboratory Services Division.

As of October 2019, four (4) sites in the Fargo-Moorhead area are now being sampled by the USGS-GF. Previously, these four sites were sampled by the NDDEQ. These sites are being monitored as part of the Fargo Diversion Project in order to collect consistent water quality data pre-and-post construction of the Fargo Diversion channel in order to document any water quality changes associated with the project. All field measurements and analysis remain the same as noted above. These four sites are denoted with an asterisk (*) below.

Table 4. Level 1 North Dakota Ambient Water Quality Monitoring Sites in the Red River Basin.

| USGS Site ID | NDDEQ Site ID | Site Name | Latitude | Longitude | Design Level | Responsible Agency |
|--------------|---------------|---------------------------------------|----------|-----------|--------------|--------------------|
| 05051300 | 385055 | Bois de Sioux River near Doran, MN | 46.1522 | -96.5789 | 1 | NDDEQ |
| 05051510 | 380083 | Red River at Brushville, MN | 46.3695 | -96.6568 | 1 | NDDEQ |
| 05053000 | 380031 | Wild Rice River near Abercrombie, ND | 46.4680 | -96.7837 | 1 | USGS-GF* |
| 05054000 | 385414 | Red River at Fargo, ND | 46.8611 | -96.7837 | 1 | USGS-GF |
| 05057000 | 380009 | Sheyenne River near Cooperstown, ND | 47.4328 | -98.0276 | 1 | NDDEQ |
| 05058000 | 380153 | Sheyenne River below Baldhill Dam, ND | 47.0339 | -98.0837 | 1 | NDDEQ |
| 05058700 | 385168 | Sheyenne River at Lisbon, ND | 46.4469 | -97.6793 | 1 | NDDEQ |
| 05059000 | 385001 | Sheyenne River near Kindred, ND | 46.6316 | -97.0006 | 1 | USGS-GF* |
| 05060100 | 384155 | Maple River below Mapleton, ND | 46.9052 | -97.0526 | 1 | USGS-GF* |
| 05066500 | 380156 | Goose River at Hillsboro, ND | 47.4094 | -97.0612 | 1 | USGS-GF |
| 05082500 | 384156 | Red River at Grand Forks, ND | 47.9275 | -97.0281 | 1 | USGS-GF |
| 05083000 | 380037 | Turtle River at Manvel, ND | 48.0786 | -97.1845 | 1 | USGS-GF |
| 05085000 | 380039 | Forest River at Minto, ND | 48.2858 | -97.3681 | 1 | USGS-GF |
| 05090000 | 380157 | Park River at Grafton, ND | 48.4247 | -97.4120 | 1 | USGS-GF |
| 05100000 | 380158 | Pembina River at Neche, ND | 48.9897 | -97.5570 | 1 | USGS-GF |
| 05102490 | 384157 | Red River at Pembina, ND | 48.9769 | -97.2376 | 1 | USGS-GF |

Table 5. Level 2 North Dakota Ambient Water Quality Monitoring Sites in the Red River Basin.

| USGS Site ID | NDDEQ Site ID | Site Name | Latitude | Longitude | Design Level | Responsible Agency |
|--------------|---------------|---|----------|-----------|--------------|--------------------|
| 05051522 | NA | Red River at Hickson, ND | 46.6597 | -96.7959 | 2 | USGS-GF |
| 05051600 | 385573 | Wild Rice River near Rutland, ND | 46.0222 | -97.5115 | 2 | USGS-GF |
| 05054200 | 385040 | Red River at Harwood, ND | 46.9770 | -96.8203 | 2 | USGS-GF* |
| 05055300 | 385505 | Sheyenne R above DL Outlet nr Flora, ND | 47.9078 | -99.4162 | 2 | SWC |
| 05056000 | 385345 | Sheyenne River near Warwick, ND | 47.8056 | -98.7162 | 2 | USGS-GF |
| 05057200 | 384126 | Baldhill Creek near Dazey, ND | 47.2292 | -98.1248 | 2 | USGS-GF |
| 05059700 | 385351 | Maple River near Enderlin, ND | 46.6216 | -97.5740 | 2 | USGS-GF |
| 05064500 | NA | Red River at Halstad, MN | 47.3519 | -96.8437 | 2 | USGS-GF |
| 05065500 | NA | Goose River nr Portland, ND | 47.5389 | -97.4556 | 2 | USGS-GF |
| 05082625 | 385370 | Turtle River at State Park near Arvilla, ND | 47.9319 | -97.5145 | 2 | USGS-GF |
| 05084000 | NA | Forest River near Fordville, ND | 48.1972 | -97.7306 | 2 | USGS-GF |
| 05092000 | 380004 | Red River at Drayton, ND | 48.5722 | -97.1476 | 2 | USGS-GF |

Table 6. Level 3 North Dakota Ambient Water Quality Monitoring Sites in the Red River Basin.

| USGS Site ID | NDDEQ Site ID | Site Name | Latitude | Longitude | Design Level | Responsible Agency |
|--------------|---------------|--|----------|-----------|--------------|--------------------|
| 05052500 | 385232 | Antelope Creek at Dwight, ND | 46.3113 | -96.7345 | 3 | USGS-GF |
| 05054500 | 380135 | Sheyenne River above Harvey, ND | 47.7028 | -99.9490 | 3 | USGS-Bis |
| 05056060 | 385089 | Mauvais Coulee Trib #3 nr Cando, ND | 48.4575 | -99.2243 | 3 | USGS-GF |
| 05056100 | 380207 | Mauvais Coulee nr Cando | 48.4481 | -99.1026 | 3 | USGS-GF |
| 05056200 | 385092 | Edmore Coulee nr Edmore | 48.3367 | -98.6604 | 3 | USGS-GF |
| 05056215 | 385093 | Edmore Coulee Trib nr Webster | 48.2664 | -98.6809 | 3 | USGS-GF |
| 05056239 | 385091 | Starkweather Coulee nr Webster, ND | 48.3206 | -98.9407 | 3 | USGS-GF |
| 05056340 | 380213 | Little Coulee nr Leeds, ND | 48.2433 | -99.3729 | 3 | USGS-GF |
| 05060500 | 385302 | Rush River at Amenia, ND | 47.0166 | -97.2143 | 3 | USGS-GF |
| 05099400 | 385287 | Little South Pembina near Walhalla, ND | 48.8653 | -98.0059 | 3 | USGS-GF |
| 05101000 | 381279 | Tongue River at Akra, ND | 48.7783 | -97.7468 | 3 | USGS-GF |

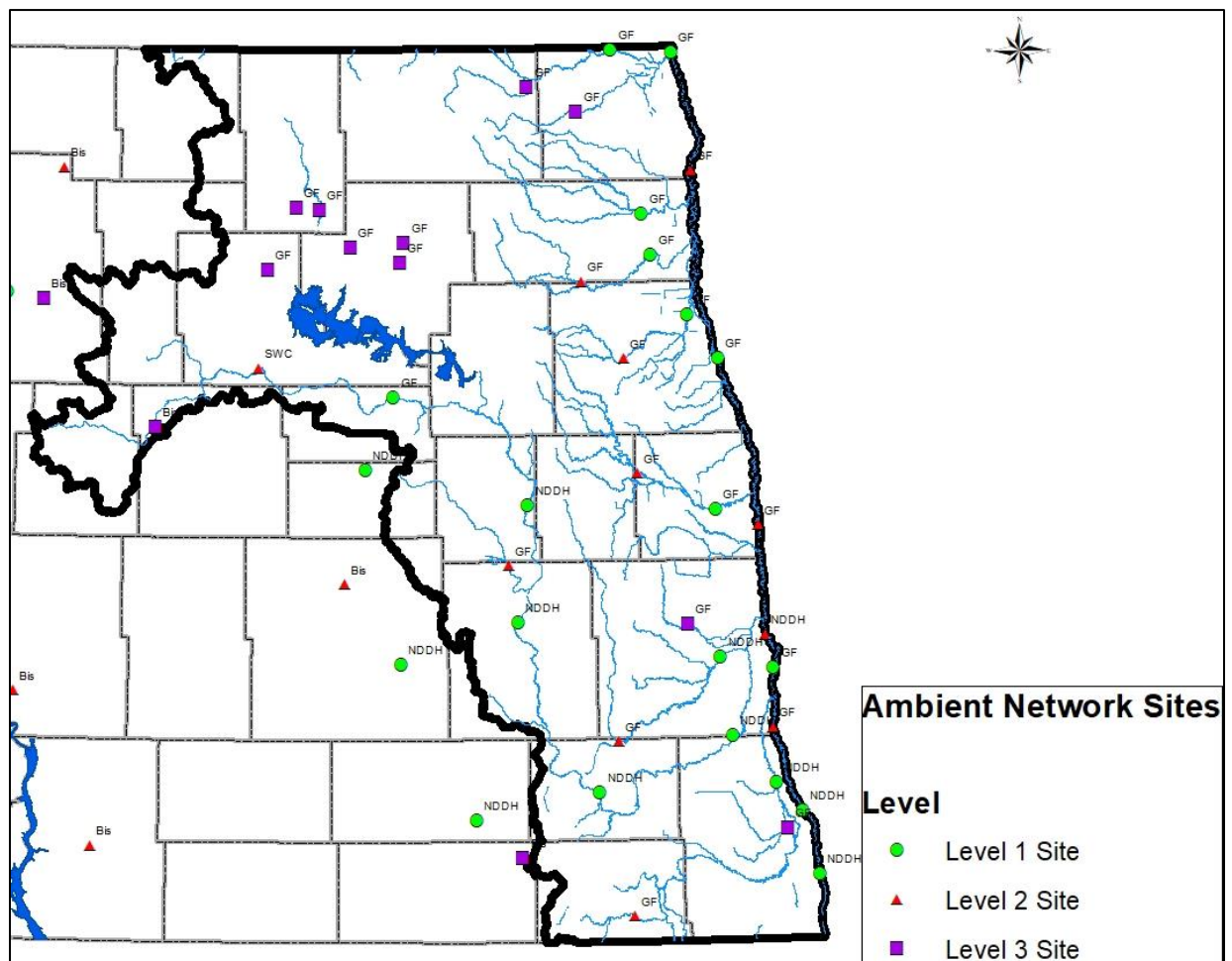


Figure 7. North Dakota Ambient Water Quality Monitoring Sites in the Red River Basin.

Table 7. North Dakota Ambient Water Quality Monitoring Parameters

| Field Measurements | Laboratory Analysis | | | |
|----------------------|-------------------------------------|--------------------------|--|----------------------|
| | General Chemistry | Trace Elements | Nutrients | Biological |
| Temperature | Sodium ^{1,2} | Aluminum ^{1,2} | Ammonia (Total) ² | E. coli ³ |
| pH | Magnesium ^{1,2} | Antimony ^{1,2} | Nitrate-nitrite (Total) ² | |
| Dissolved Oxygen | Potassium ^{1,2} | Arsenic ^{1,2} | Total Kjeldahl Nitrogen ² | |
| Specific Conductance | Calcium ^{1,2} | Barium ^{1,2} | Total Nitrogen ² | |
| | Manganese ^{1,2} | Beryllium ^{1,2} | Total Phosphorus ² | |
| | Iron ^{1,2} | Boron ^{1,2} | Total Organic Carbon ³ | |
| | Chloride ^{1,2} | Cadmium ^{1,2} | Ammonia (Dissolved) ² | |
| | Fluoride ^{1,2} | Chromium ^{1,2} | Nitrate-nitrite (Dissolved) ² | |
| | Sulfate ^{1,2} | Copper ^{1,2} | Total Kjeldahl Nitrogen (Dissolved) ² | |
| | Carbonate ² | Lead ^{1,2} | Total Nitrogen (Dissolved) ² | |
| | Bicarbonate ² | Nickel ^{1,2} | Total Phosphorus (Dissolved) ² | |
| | Hydroxide ² | Silica ^{1,2} | Dissolved Organic Carbon ³ | |
| | Alkalinity ² | Silver ^{1,2} | | |
| | Hardness ² | Selenium ^{1,2} | | |
| | Total Dissolved Solids ³ | Thallium ^{1,2} | | |
| | Total Suspended Solids ¹ | Zinc ^{1,2} | | |

¹Analyzed as dissolved.²Sampled and analyzed at level 1, 2 and 3 sites.³Sampled and analyzed at level 1 sites.**Supplemental Monitoring Activities**

In addition to the ambient monitoring activities listed above, in 2020 two supplemental monitoring programs will focus water quality surveillance efforts in the Red River basin. First, the NDDEQ's Lake Water Quality Assessment (LWQA) Program will visit approximately 20 lakes/reservoirs on four separate visits (May – October) in order to assess current chemical and biological condition. Additionally, the Biological Monitoring Program will visit approximately 30 wadeable Red River tributaries in North Dakota to assess current chemical and biological condition using fish, macroinvertebrate and/or periphyton assemblages as indicators.

North Dakota Department of Agriculture Pesticide Monitoring Program

As a compliment to North Dakota's revised ambient water quality monitoring program, in 2019 the NDDEQ and the USGS cooperated with the North Dakota Department of Agriculture (NDDA) in a state pesticide monitoring program. The goals of the 2019 monitoring program were to: 1) determine the occurrence and concentration of pesticides in North Dakota rivers and streams; 2) identify trends in pesticide contamination to guide regulatory activities; 3) determine whether any pesticides may be present at concentrations that could adversely affect human health, aquatic life, or wildlife dependent on aquatic life; and 4) evaluate levels of certain neonicotinoid insecticides in North Dakota's rivers and streams.

Through this cooperative pesticide monitoring program, the NDDEQ and the USGS collected pesticide samples April through August and in October at all of the level 1 water quality monitoring sites in the state, while the NDDA provided sample analysis through a contract with Montana State University's Agriculture Experiment Station Analytical Laboratory. Through this program six (6) samples were collected at each site in 2019. A final report detailing the results of the 2019 monitoring program, including the results from samples collected in the Red River basin is available at <https://www.nd.gov/ndda/publications/reports/reports/pesticide-monitoring-report-2019>.

6.03 Manitoba

Surface Water Quality Monitoring

During the water year, Manitoba Agriculture and Resource Development continued to monitor water quality on a monthly basis at two sites on the Red River within Manitoba. These sites are located upstream of the City of Winnipeg at the Floodway control structure at St. Norbert and downstream of the City of Winnipeg at Selkirk (Figure 8). Additionally, joint federal/provincial samples were collected at Emerson and Selkirk for quality control/quality assurance purposes to ensure the long-term consistency of comparability between federal and provincial datasets. Variables measured included physical parameters, general chemistry, suspended sediment, bacteria, industrial organics, trace elements, nutrients, and agricultural chemicals. Long-term variables monitored by Manitoba Agriculture and Resource Development are shown in Table 8. Benthic macroinvertebrates were also collected from the Red River at Emerson and Selkirk in September 2019.

Additionally, Manitoba Agriculture and Resource Development conducted routine monitoring at seven sites on six tributary streams to the Red River (Figure 8) during the 2018-2019 water year. Tributary sites were monitored on a quarterly basis (October, January, April and July) throughout the water year and samples were analyzed for a wide range of variables including physical parameters, general chemistry, suspended sediment, bacteria, industrial organics, trace elements and nutrients. Long-term monitoring of tributary streams allows Manitoba Agriculture and Resource Development to identify potential sources of pollution to the Red River and develop management strategies that address existing and emerging water quality issues within the Red River watershed.

Red River – Main Stem

During this reporting period, water quality in the Manitoba reach of the Red River main stem remained similar to previous years. Overall, dissolved oxygen concentrations in the Red River were sufficient to support aquatic life and were relatively high with an average concentration of 8.40 mg/L upstream of the City of Winnipeg at St. Norbert and 9.04 mg/L downstream of the City of Winnipeg at Selkirk. The lowest dissolved oxygen concentrations observed occurred during the July 2018 period, with 4.3 mg/L at St. Norbert and 6.3 mg/L at Selkirk. With the exception of the July sample at St. Norbert, all dissolved oxygen concentrations observed were above the 5.0 mg/L threshold required for the protection of aquatic life.

Furthermore, dissolved oxygen concentrations at St. Norbert had returned to acceptable levels by the August monitoring period, and remained above the water quality objective for the remainder of the water year.

Densities of *Escherichia coli* (*E. coli*) bacteria downstream of the City of Winnipeg were higher than the previous reporting period. The mean density downstream of the City of Winnipeg was 205 organisms / 100 mL, compared to 92 organisms / 100 mL in the previous reporting period. The mean density of *E. coli* bacteria in the upstream reach at St. Norbert was also higher than the previous reporting year with 44 organisms / 100 mL, compared to the previous 5.5 organisms / 100 mL. Densities of *E. coli* bacteria did exceed the recreational water quality objective of 200 organisms / 100 mL (Manitoba Water Quality Standards, Objectives, and Guidelines, 2011) upstream of the City of Winnipeg at St. Norbert twice during the current reporting period. Exceedances occurred during the October 2018 and September 2019 sampling periods where *E. coli* densities were 276 and 206 organisms / 100 mL, respectively. Similarly, *E. coli* densities exceeded the recreational water quality objective in samples downstream of the City of Winnipeg on three occasions during the current reporting period. Exceedances occurred during the October 2018 and August 2019 sampling periods where *E. coli* densities were 260 and 727 organisms / 100 mL, respectively. During the July 2019 sampling period, *E. coli* densities were 6.5 higher than the recreational water quality guidelines with an *E. coli* density of 1300 organisms / 100 mL.

During this reporting period, twelve samples were analyzed for routine pesticide screening upstream of the City of Winnipeg on the Red River at St. Norbert. Of the 53 routinely monitored pesticides, nine were detected (17 per cent rate of detection) in the Red River at St. Norbert, which represents a slight decrease from the previous reporting period (23 per cent rate of detection). Dicamba, Glyphosate, and AMPA were the most commonly detected pesticides with nine (75 per cent rate of detection), five (42 per cent rate of detection), and four detections (33 per cent rate of detection), respectively. 2,4-D and Atrazine were detected on three occasions (25 per cent rate of detection), while Atrazine desethyl was detected twice (17 per cent rate of detection) during the current reporting period. Bromoxynil, Metribuzin, and Thifensulfuron methyl were each detected once (8 per cent rate of detection). Dicamba exceeded the irrigation guideline of 0.006 µg/L for all samples with detections (October and December 2018, January and April-September 2019), with concentrations ranging from 0.010 to 0.198 µg/L or nearly 2 to 33 times greater than the irrigation guideline. None of the other pesticides detected upstream of Winnipeg exceeded water quality guidelines (where available) for the protection of surface water used as sources of drinking water supply, protection of aquatic life, irrigation, or livestock uses.

A total of twelve samples were also collected from downstream of the City of Winnipeg at Selkirk during the reporting period and analyzed for pesticides. However, only seven pesticides out of the 53 monitored were detected downstream of the City of Winnipeg at Selkirk (13 per cent rate of detection). This represented a slight decrease in overall pesticide detection versus the eleven detections at this site in the previous reporting year. As with the upstream site, Dicamba was the most commonly detected pesticide in the Red River at Selkirk with nine detections (75 per cent rate of detection), while Glyphosate and AMPA were both detected four times (33 per cent rate of detection). 2,4-D was detected fewer times, compared to the previous period, with 3 detections (25 per cent rate of detection) during the current reporting period. Atrazine and Atrazine desethyl were each detected twice (17 per cent rate of detection), while Benomyl was detected once (8 per cent rate of detection). Similar to the Red River at St. Norbert site, Dicamba exceeded the irrigation guideline (0.006 µg/L) for all samples with detections (October and December 2018, January and April-August 2019) at Selkirk with concentrations ranging from 0.010 to 0.580 µg/L or nearly 2 to 100 times greater than the irrigation guideline. None of the other pesticide species detected downstream of Winnipeg exceeded water quality guidelines (where available) for the protection of surface water used as sources of drinking water supply, protection of aquatic life, irrigation, or livestock uses.

Red River - Tributary Streams

During this reporting period, seven sampling stations on six tributary rivers (Boyne, Rat, Roseau, Morris, La Salle rivers and two sites on the Seine River) were each sampled at least quarterly but more frequently at some sites (e.g., Rat, Boyne and La Salle Rivers sampled 2-3 times during April spring freshet period). In general, water quality parameters in these Red River tributaries remained comparable to past years. Average dissolved oxygen concentrations in the Roseau, Rat, Morris, Seine and La Salle rivers were similar to the previous reporting period, ranging from 6.98 to 9.35 mg/L. However, the mean dissolved oxygen concentration observed for the Boyne River tributary site was low in comparison to previous years, with an average dissolved oxygen concentration of 4.55 mg/L. In particular, samples collected for the October 2018 and January 2019 sampling periods had extremely low dissolved oxygen concentrations of 1.20 and 0.30 mg/L respectively. With the exception of these two sampling periods on the Boyne River, and one sampling period each for the Rat (July 2019), La Salle (January 2019) and Seine Rivers (January 2019), dissolved oxygen concentrations were sufficient to support aquatic life and usually above the Manitoba Water Quality Objective in the Red River tributaries.

Average densities of *E. coli* bacteria for the Red River tributary sites ranged from 15 to 437 organisms / 100 mL for the current reporting period. With the exception of three samples collected from the Rat, Morris and Seine (at south Perimeter) River tributary sites (>2420, 488 and 548 organisms / 100 mL, respectively) during the July 2019 quarterly period, all other samples collected were well below the recreational water quality objective for *E. coli* (200 organisms / 100 mL) during this current reporting period. Additionally, while the Rat River tributary site had an average density of 437 organisms / 100 mL during this reporting period, this was primarily the result of the large influence exerted by the very high July sample on the annual calculation. When the July result is omitted from the calculation, the annual density of *E. coli* bacteria observed at the Rat River site decreases considerably to within acceptable levels with an average density of 41.4 organisms / 100 mL.

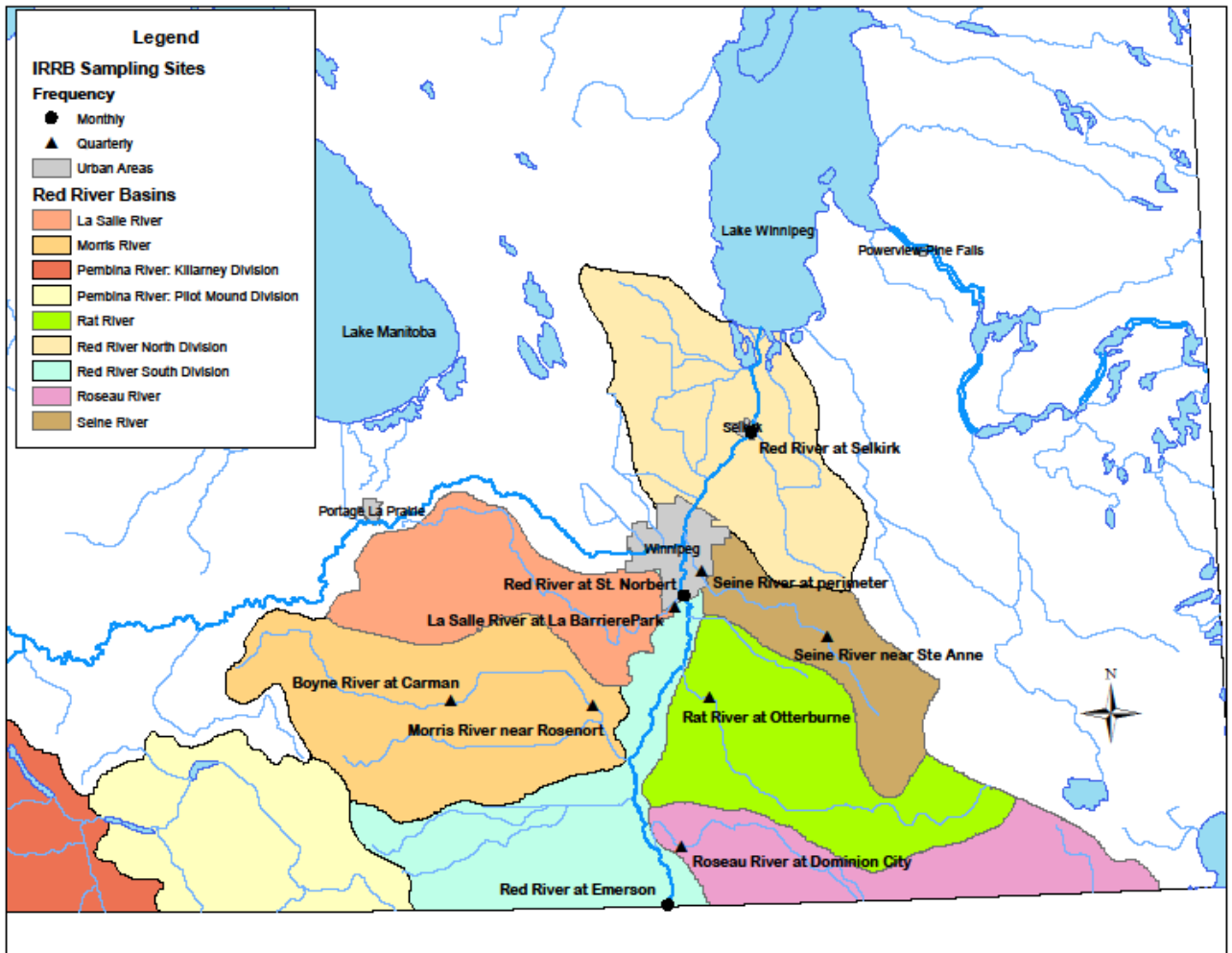


Figure 8. Location of water quality and benthic invertebrate sampling sites in the Red River watershed (Manitoba). Benthic invertebrates are collected 1x/year from the Red River at Emerson and Selkirk sites.

Table 8. Routine surface water quality monitoring variables monitored by Manitoba Agriculture and Resource Development on the Red River and tributary sites within Manitoba, Canada.

| Variables | Units |
|------------------------------------|-------|
| 2,4-DB | ug/L |
| 2,4-D | ug/L |
| 2,4-DP | ug/L |
| ALACHLOR | ug/L |
| ALKALINITY CO ₃ | mg/L |
| ALKALINITY OH | mg/L |
| ALKALINITY TOTAL CaCO ₃ | mg/L |
| ALKALINITY TOTAL HCO ₃ | mg/L |
| ALUMINUM DISSOLVED | mg/L |
| ALUMINUM TOTAL | mg/L |
| AMMONIA DISSOLVED | mg/L |
| AMPA (AMINOMETHYLPHOSPHONIC ACID) | ug/L |
| ANTIMONY TOTAL | mg/L |
| ARSENIC TOTAL | mg/L |
| ATRAZINE DESETHYL | ug/L |
| ATRAZINE | ug/L |
| AZINPHOS METHYL | ug/L |
| BARIUM TOTAL | mg/L |
| BENOMYL | ug/L |
| BERYLLIUM TOTAL | mg/L |
| BISMUTH TOTAL | mg/L |
| BORON TOTAL | mg/L |
| BROMACIL | ug/L |
| BROMOXYNIL | ug/L |
| CADMIUM TOTAL | mg/L |
| CALCIUM TOTAL | mg/L |
| CARBOFURAN | ug/L |
| CARBON TOTAL INORGANIC | mg/L |
| CARBON TOTAL ORGANIC (TOC) | mg/L |
| CARBON TOTAL | mg/L |
| CARBOXIN (CARBATHIN) | ug/L |
| CESIUM TOTAL | mg/L |
| CHLORDANE-CIS | ug/L |
| CHLORDANE-TRANS | ug/L |
| CHLORIDE DISSOLVED | mg/L |
| CHLOROPHYLL A | ug/L |
| CHLORPYRIFOS-ETHYL (DURBAN) | ug/L |
| CHROMIUM HEXAVALENT DISSOLVED | mg/L |
| CHROMIUM TOTAL (CR) | mg/L |
| COBALT TOTAL | mg/L |
| COLOUR TRUE | CU |
| CONDUCTIVITY (AT 25C) | uS/cm |
| COPPER TOTAL (CU) | mg/L |
| CYANAZINE | ug/L |
| DELTAMETHRIN | ug/L |
| DIAZINON | ug/L |
| DICAMBA (BANVEL) | ug/L |
| DICHLOROPROP(2,4-DP) | ug/L |
| DICLOFOP-METHYL | ug/L |
| DIMETHOATE (CYGON) | ug/L |
| DINOSEB | ug/L |

Table 8. Continued....

| Variables | Units |
|--|------------|
| DIURON | ug/L |
| EPTAM | ug/L |
| ESCHERICHIA, COLI | MPN/100 mL |
| ETHALFLURALIN (EDGE) | ug/L |
| FENOXAPROP | ug/L |
| GAMMA-BENZENEHEXACHLORIDE (LINDANE) | ug/L |
| GLYPHOSATE (ROUNDUP) | ug/L |
| HARDNESS TOTAL CaCO ₃ | mg/L |
| IMAZAMETHABENZ-METHYL | ug/L |
| IRON TOTAL (FE) | mg/L |
| LEAD TOTAL | mg/L |
| LITHIUM TOTAL | mg/L |
| MAGNESIUM TOTAL | mg/L |
| MALATHION | ug/L |
| MANGANESE TOTAL (MN) | mg/L |
| MCPA | ug/L |
| MCP (MECOPROP) | ug/L |
| METASULFURON-ME | ug/L |
| METHOXYCHLOR (P,P'-METHOXYCHLOR)_ | ug/L |
| METRIBUZIN | ug/L |
| MOLYBDENUM TOTAL | mg/L |
| NICKEL TOTAL | mg/L |
| NITROGEN DISSOLVED NO ₃ & NO ₂ | mg/L |
| NITROGEN TOTAL KJELDAHL (TKN) | mg/L |
| OXYGEN BIOCHEMICAL DEMAND | mg/L |
| OXYGEN DISSOLVED | mg/L |
| PARATHION ETHYL | ug/L |
| PARATHION METHYL | ug/L |
| PENTACHLOROPHENOL | ug/L |
| PHEOPHYTIN A | ug/L |
| PHOSPHOROUS-ACID HYDROLYZABLE | mg/L |
| PHOSPHOROUS-TOTAL-ORTHO | mg/L |
| PHOSPHORUS DISSOLVED ORTHO | mg/L |
| PHOSPHORUS PARTICULATE | mg/L |
| PHOSPHORUS TOTAL (METALS SCAN) | mg/L |
| PHOSPHORUS TOTAL (P) | mg/L |
| PHOSPHORUS TOTAL DISSOLVED | mg/L |
| PHOSPHORUS TOTAL INORGANIC | mg/L |
| pH | pH units |
| PICLORAM (TORDON) | ug/L |
| POTASSIUM TOTAL | mg/L |
| PROPANIL | ug/L |
| PROPOXUR | ug/L |
| QUZALOFOP | ug/L |
| RUBIDIUM TOTAL | mg/L |
| SELENIUM TOTAL | mg/L |
| SETHOXYDIM | ug/L |
| SILICON TOTAL | mg/L |
| SILVER TOTAL | mg/L |
| SIMAZINE | ug/L |
| SODIUM TOTAL | mg/L |

Table 8. Continued....

| Variables | Units |
|------------------------|------------|
| SULPHATE DISSOLVED | mg/L |
| TELLURIUM TOTAL | mg/L |
| TERBUFOS | ug/L |
| THALLIUM TOTAL | mg/L |
| THIFENSULFURON-ME | ng/L |
| THORIUM TOTAL | mg/L |
| TIN TOTAL | mg/L |
| TITANIUM TOTAL | mg/L |
| TOTAL DISSOLVED SOLIDS | mg/L @180C |
| TOTAL SUSPENDED SOLIDS | mg/L |
| TRALKOXYDIM | ug/L |
| TRIALATE (AVADEXBW) | ug/L |
| TRIBENURON | ug/L |
| TRICLOPYR | ug/L |
| TRIFLURALIN(TREFLAN) | ug/L |
| TUNGSTEN TOTAL | mg/L |
| TURBIDITY | NTU |
| URANIUM TOTAL | mg/L |
| VANADIUM TOTAL | mg/L |
| ZINC TOTAL (ZN) | mg/L |
| ZIRCONIUM TOTAL | mg/L |

7.0 WATER POLLUTION CONTROL

7.01 Contingency Plan

In January 1981 a contingency plan was developed by the former International Red River Pollution Board. The purpose of the plan, which has been adopted by the IRRB, is to ensure that positive coordinated action is taken to minimize public health hazards and environmental damage in the event of a spill. This plan does not supersede any local or national contingency plans in existence but rather serves to coordinate these activities. The plan becomes effective wherever the discharge of a pollutant within the Red River basin has the potential to adversely impact the Red River. The plan also becomes effective at any time when exceedances of either water quality objectives or alert levels as described in Chapter 5 are observed at the international boundary. A current list of contacts and telephone numbers associated with the contingency plan is included in Appendix C.

7.02 Spills and Releases

Manitoba - Pollution Sources

Three municipalities with populations greater than 1,000 discharge treated effluents directly to the Red River within Manitoba. The Town of Morris discharges for a short period of time each spring and fall, while the City of Winnipeg's South End and North End Water Pollution Control Centres and the Town of Selkirk discharge continuously. Volumes and quality of effluent have not changed significantly from previous years. In addition to the two major wastewater treatment facilities within the City of Winnipeg, discharges also occur from 79 combined sewer outfalls and 90 major land drainage outfalls. Most tributary streams also receive treated wastewater effluents from nearby communities.

Notification Regarding Intensive Livestock Operations

During the reporting period, Manitoba was not notified of any intensive livestock operations proposing to locate near the international border on the North Dakota or Minnesota side. In Manitoba, no intensive livestock proposals were proposed near the international border between Oct 2018 and Sept 2019.

Pollution Abatement

Manitoba Water Quality Standards, Objectives, and Guidelines are applicable to streams within the Red River basin. Water uses protected in the Red River basin include domestic water supply source, protection of aquatic life, industrial uses, irrigation, livestock watering, and water-related recreation.

Treated municipal effluents discharged to the Red River and tributary streams in Manitoba are licensed under The Environment Act (Manitoba). Disinfection with ultraviolet light technology has been installed and is operational at the City of Winnipeg's South and North End Water Pollution Control Centres. In August 2004, the City of Winnipeg introduced a web-based system to inform the public whenever there is likely to be a sewer overflow into the Red or Assiniboine Rivers (<http://winnipeg.ca/waterandwaste/sewage/overflow/previous24.stm>). The City of Winnipeg also provides annual summaries of combined sewer overflows events, volumes and rainfall information (<https://winnipeg.ca/waterandwaste/sewage/annualResults/default.stm>).

Manitoba continues to work to understand sources of nutrients to Lake Winnipeg, to monitor the impacts of excess nutrients and to reduce nutrient loading to achieve a 50 % reduction in phosphorus in Lake Winnipeg. Specific nutrient concentration and loading targets for major tributaries to Lake Winnipeg are currently being developed in partnership with neighbouring jurisdictions at the international boundary. Manitoba has also developed draft nutrient concentration objectives for Lake Winnipeg and nutrient loading targets for the major tributary rivers flowing into Lake Winnipeg.

The Sustainable Watersheds Act received royal assent on June 4, 2018 in Manitoba. The Act introduces a streamlined approach to drainage including stronger enforcement powers for illegal drainage, provisions to enable offset requirements for loss of significant wetlands, and changes to The Conservation Districts Act to shift to watershed-based boundaries. The Act also enables the development of nutrient targets and establishes reporting requirements and this work is currently underway. The Act also supports mandate commitments to implement watershed-based planning for drainage and water resource management and also provides a foundation to implement a province-wide ecological goods and service program called GRowing Outcomes in Watersheds or GROW.

GROW is a homegrown approach to ecological goods and services programming that is based on the Alternate Land Use Services (ALUS) model. GROW will create ecological goods and services on the agricultural landscape and encourage beneficial management practices like water retention, grassland restoration, wetland restoration or improved riparian area management by incenting farmers to create new environmental improvements on the landscape. The expected outcomes of GROW are reduced flooding, improved water quality, improved on-farm management of nutrients, enhanced resiliency to the impacts of climate change, improved biodiversity, enhanced carbon storage, enhanced sustainable food production and improved groundwater quality and recharge. The Manitoba government announced the GROW fund, a \$52 million endowment that is intended to support practices that will to reduce flooding, improve water quality and nutrient management, and support the overall goals of the made-in-Manitoba Climate and Green Plan. In addition, Manitoba also recently announced a \$102 million Conservation Trust, intended support the work of watershed districts, including for watershed planning and projects.

In addition, Manitoba continues to implement a series of key water protection initiatives aimed at reducing nutrient loading to waterways including regulations restricting nutrient applications to land, requirements for advanced wastewater treatment to remove nutrients and improving surface water retention and management through integrated watershed management planning:

- Nutrient Management Regulation:
 - Manitoba is continuing to implement the Nutrient Management Regulation (https://gov.mb.ca/water/lakes-beaches-rivers/nutrient_management/index.html). The Nutrient Management Regulation addresses the application of nutrients to land from all sources, including livestock manure, inorganic fertilizer, cosmetic fertilizers, and biosolids/sludge.
 - Under the Nutrient Management Regulation, nutrients (regardless of the source)

cannot be applied to land between November 10th and April 10th.

- Wastewater Treatment:
 - The Manitoba Water Quality Standards, Objectives and Guidelines Regulation (<https://gov.mb.ca/water/lakes-beaches-rivers/guidelines/index.html>) includes province-wide standards for phosphorus in wastewater effluent (1 mg/L) and, where site-specific conditions warrant, nitrogen (15 mg/L). Under the province-wide nutrient standards, a 1 mg/L phosphorus limit applies to all new, expanding or modified wastewater treatment facilities. Small wastewater treatment facilities discharging more than 820 kilograms of phosphorus per year (serving less than 2,000 people or equivalent) have the option of implementing a demonstrated nutrient reduction strategy (for example, a constructed wetland, effluent irrigation, etc.) or the 1 mg/L phosphorus limit. Some facilities in Manitoba have received an extension for implementing the 1 mg/L phosphorus standard through an approved phosphorus compliance plan that
- Integrated Watershed Management Planning:
 - Work on integrated watershed management planning under The Water Protection Act continues in Manitoba. To date 27 plans have been initiated, of which 23 have been completed. One watershed plan was completed in 2018-19 for the Southwest Interlake Watershed. Planning continues for four watersheds including two in the Red River, the Boyne-Morris River and Roseau River watersheds. The first integrated watershed management plan completed in Manitoba (for the East Souris River) is now being renewed as the first second generation plan.
 - Integrated watershed management plans are compiled by local water planning authorities with stakeholder input. Plans are implemented, monitored and updated regularly (every ten years) by these authorities. Water planning authorities are designated under The Water Protection Act and the development of integrated watershed management plans is guided by specifications in the Act. Manitoba provides financial, planning and technical assistance throughout the process. The integrated watershed management plans include a report on current science and traditional knowledge of the watershed as well as actions to monitor, maintain, and improve environmental conditions in the watershed (<https://gov.mb.ca/water/watershed/iwmp/index.html>).

North Dakota

Spills and Releases

The North Dakota Pollutant Discharge Elimination System (NDPDES) program requires all permitted facilities (industrial and municipal) to report wastewater spills and by-passes. During this reporting period (October 1, 2018 through September 30, 2019), there were 11 releases reported to the department in the Red River basin in North Dakota. The releases were related to pipe break/mechanical failure and lift station problems (overflows/bypasses) due to localized flooding and excessive precipitation. The facilities followed the reporting requirements of their permit. The spills/releases were followed up by department staff and all actions were resolved. Formal enforcement was required for one facility based on the findings of the department.

7.03 Pollution Abatement and Advisories

Point Source Control Program

The department regulates the release of wastewater and stormwater from point sources into waters of the state through permits issued through the NDPDES Program. Permitted municipal and industrial point source dischargers must meet technology or water quality based effluent limits. In addition, all major municipal and industrial permittees must monitor their discharge for whole effluent toxicity (WET) on a regular basis.

Toxic pollutants in wastewater discharges are regulated through the industrial pretreatment program which is administered by the NDPDES Program. The cities of Grand Forks, Fargo, and West Fargo all have approved pretreatment programs within the Red River basin in North Dakota.

There are presently 151 facilities with a NDPDES Program permit in the Red River basin. Of these, there are 36 industrial wastewater permits and 115 domestic/municipal wastewater permits. Most of the domestic/municipal wastewater permits are for small lagoon systems which typically discharge 2-3 times a year for a period of a few days to a few weeks.

Stormwater

The NDPDES Program permits stormwater discharges from industrial sites, construction sites and larger municipalities or Municipal Separate Storm Sewer Systems (MS4s). The cities of Grand Forks, Fargo, West Fargo, Horace and their urbanized area continue to implement their MS4 permits within the Red River basin in North Dakota.

A majority of the construction stormwater permitting in North Dakota is now in the western part of the state. There are approximately 311 stormwater permits for construction activity and 135 industrial stormwater permits in the Red River basin in North Dakota.

Animal Feeding Operations (AFOs)

The NDPDES Program continues to regulate animal feeding operations (AFOs) in the North Dakota. All large (>1000 animal units) permitted confined animal feeding operations (CAFOs) are inspected annually; whereas medium and small AFOs are inspected on an as-needed basis. There are 121 AFOs permitted by the NDDEQ in the Red River basin. Of these, there are 25 designated as large CAFOs.

Nonpoint Source Pollution Management Program

The Division of Water Quality is responsible for administering the Clean Water Act Section 319 Nonpoint Source Pollution Management Program (NPS Program) in North Dakota. Section 319 of the Clean Water Act and guidance provided by EPA defines the scope of the NPS Program, while the department administers the program with input from the North Dakota Nonpoint Source Pollution Task Force (Task Force). The Task Force is comprised of representatives from state and federal natural resource agencies, commodity/producer groups and private wildlife/natural resource organizations.

Each year, Section 319 funds are appropriated to EPA by the U.S. Congress for nonpoint source pollution (NPS pollution) management. The amount of Section 319 funding available to each state is based on an allocation formula and variable from year to year. In North Dakota, approximately 80% (i.e., \$3,000,000) of the annual Section 319 grant award is allocated to various organizations (e.g., soil conservation districts, water resource boards, state agencies, universities, and nonprofit organizations) to implement NPS pollution education, assessment and/or abatement projects. The balance of funds awarded to the state are used to support department staff and laboratory services. Section 319 funds awarded to the state and approved projects require a 40 percent non-federal match.

Through the NPS Program, the department is currently supporting several watershed projects in the Red River basin that are focused on nonpoint source pollution abatement. In most cases, these projects are addressing NPS pollution associated with agricultural activities. A map depicting the location of these projects is provided in Figure 9. Best management practices (BMP) implemented by the active watershed projects in the Red River Basin using FY14-19 Section 319 funding are listed in Table 9. The following is a summary of the active watershed projects as of June 2020 in the Red River Basin.

- The Richland County SCD has been using Section 319 funding since 2011 to support the implementation of the Antelope Creek Watershed and Wild Rice Riparian Corridor project. The SCD was also awarded Outdoor Heritage Funds in 2014 to supplement the Section 319 funds committed for the implementation of BMPs. The Outdoor Heritage Funds are state funds generated through oil tax revenues. The primary goal of the project is to restore the recreational uses of the impaired reaches of Antelope Creek and the Wild Rice River in Richland County. As a secondary goal, the project will protect and enhance aquatic life uses of Antelope Creek and the Wild Rice River through targeted implementation of BMPs within or immediately adjacent to the riparian corridor. These goals are being accomplished through one-on-one conservation planning; implementation of agricultural BMPs; septic system renovation; and public education. Through these efforts the project has reported declining E. coli bacteria concentrations in some reaches of the Wild Rice River. For one of these reaches, E. coli concentrations are now being maintained below state water quality standards criteria, indicating recreational uses have been fully restored. The water quality improvements in this reach are described in an Environmental Protection Agency (EPA) “Success Story.” The web address for the EPA Success Story is https://www.epa.gov/sites/production/files/2015-11/documents/nd_wildrice.pdf.
- The Cass County SCD was awarded Section 319 funding for the Maple River Watershed project in 2018. The long-term goal of the project is to restore the recreational uses of the Maple River in Cass County. As a secondary goal, the project is also promoting the implementation of best management practices (BMP) that improve soil health and reduce nutrient and sediment delivery to the Maple River. To achieve these goals, the project sponsors initiated a watershed-wide educational program and are also providing financial and technical assistance to implement BMPs. Emphasis is being placed on installing BMPs in

priority cropland areas and along riparian corridors. Practices that may be installed include septic systems, cross-fencing, off-site watering facilities, nutrient management, water wells, cover crops, riparian buffers and grass waterways.

- The Wild Rice SCD has utilized Section 319 funding since 2010 to implement the Wild Rice River Restoration and Riparian project. The project was also allocated Outdoor Heritage funds in 2014 to support BMPs implemented in the project area. The project is currently focusing on the watersheds for Shortfoot and Crooked Creek as well as the riparian corridor along the main stem of the Wild Rice River in Sargent County. The goal of the project is to improve aquatic life use in the Wild Rice River, Shortfoot Creek and Crooked Creek. This is being accomplished by providing financial and technical assistance to agricultural producers to implement BMPs that reduce livestock impacts, restore riparian habitat and improve the buffering capabilities of riparian areas and adjacent lands. Practices being promoted and installed include manure management, cross fencing, grazing management, no-till, cover crops, nutrient management, riparian easements, grassed waterways, filter strips, and tree plantings. Because of these efforts, the project sponsors have reported declining trends in E. coli bacteria concentrations for one stream reach located in the Shortfoot Creek watershed.
- The Walsh County Three Rivers SCD was initially awarded Section 319 funding for the Homme Dam watershed project in 2014. That project area was expanded in 2018 to include the entire Park River watershed upstream of Grafton. Additional Section 319 funds were awarded in 2018 to support efforts in the expanded project area. Outdoor Heritage Funds were also awarded to the project in 2015 to support BMP implementation. The SCD has also recently partnered with General Mills to secure financial support for No Till/Strip Till Demonstrations in the county. The goal for the expanded project area is to improve the recreational and aquatic life uses of the Park River and Homme Dam reservoir. E. coli bacteria, phosphorus and nitrogen are the primary NPS pollutants being addressed by the project. To achieve the long-term goal, technical and financial assistance is being provided to agricultural producers to implement BMPs that protect or enhance riparian areas as well as improve grazing and woodland management along the Park River, upstream and downstream from Homme Dam reservoir. Practices being promoted and implemented include fencing, off-site watering facilities, water wells, cover crops, grassed waterways, riparian tree plantings; grass buffers/filters and windbreaks.
- The Wells County SCD was awarded Section 319 funding for the Middle Sheyenne River watershed project in 2016. The project area includes a one-mile corridor along both sides of the Sheyenne River from Harvey Dam downstream to the Eddy County line. The SCD is using the 319 funding to implement BMPs that restore the recreational and aquatic life uses of the Middle Sheyenne River. To achieve the goal, the SCD is offering technical and financial assistance to agricultural producers for conservation planning and BMP installation. The project is also conducting information/education activities focused on practices that reduce livestock impacts within the riparian corridor. Priority BMPs being

promoted and installed include prescribed grazing systems, fencing, watering facilities, cover crops, septic systems and manure management systems.

- The Grand Forks County SCD was awarded Section 319 funding in 2016 and 2019 to support the implementation of the English Coulee watershed project. The main goal for the project is to achieve an improving trend in the recreational and aquatic life uses of English Coulee. A secondary goal of the project is to educate the public on the relationship between healthy soils and water quality through education and BMP demonstrations. To accomplish these goals, the SCD is offering technical and financial assistance to producers for grazing management, fencing, tanks, pipeline, use exclusion, cover crops, and septic systems

Table 9. BMPs implemented with FY14-FY19 Section 319 funding in the active watershed project areas located in the Red River Basin, as of June 2020.

| BMP Category/BMP Type | Amount Applied |
|--|-----------------------|
| Cropland | |
| Cover Crops | 8,262 acres |
| Erosion Control | |
| Critical Area Plantings | 23 acres |
| Grazing Management | |
| Livestock Fencing | 79,519 linear feet |
| Pasture/Hayland Planting | 251 acres |
| Pond | 1 pond |
| Rural Water Hookup | 1 hookups |
| Trough and Tanks | 8 tanks |
| Wells (livestock watering only) | 3 wells |
| Livestock Manure Management Systems | |
| Full Containment Manure Management System | 8 systems * |
| Portable Windbreaks | 824 linear feet |
| Waste Utilization | 2,020 tons |
| Miscellaneous Practices | |
| Septic System Renovations | 50 systems |
| Well Decommissioning | 30 wells |
| Riparian Area Management | |
| Riparian Easements (Cropland) | 62 acres |
| Riparian Herbaceous Cover | 266 acres |
| Streambank and Shoreline Stabilization | 5,200 linear feet |
| Tree Hand Plants | 1,045 trees |

**Systems implemented with Section 319 funds allocated to the statewide manure management programs administered by the ND Stockmen's Association and ND Department of Agriculture.*

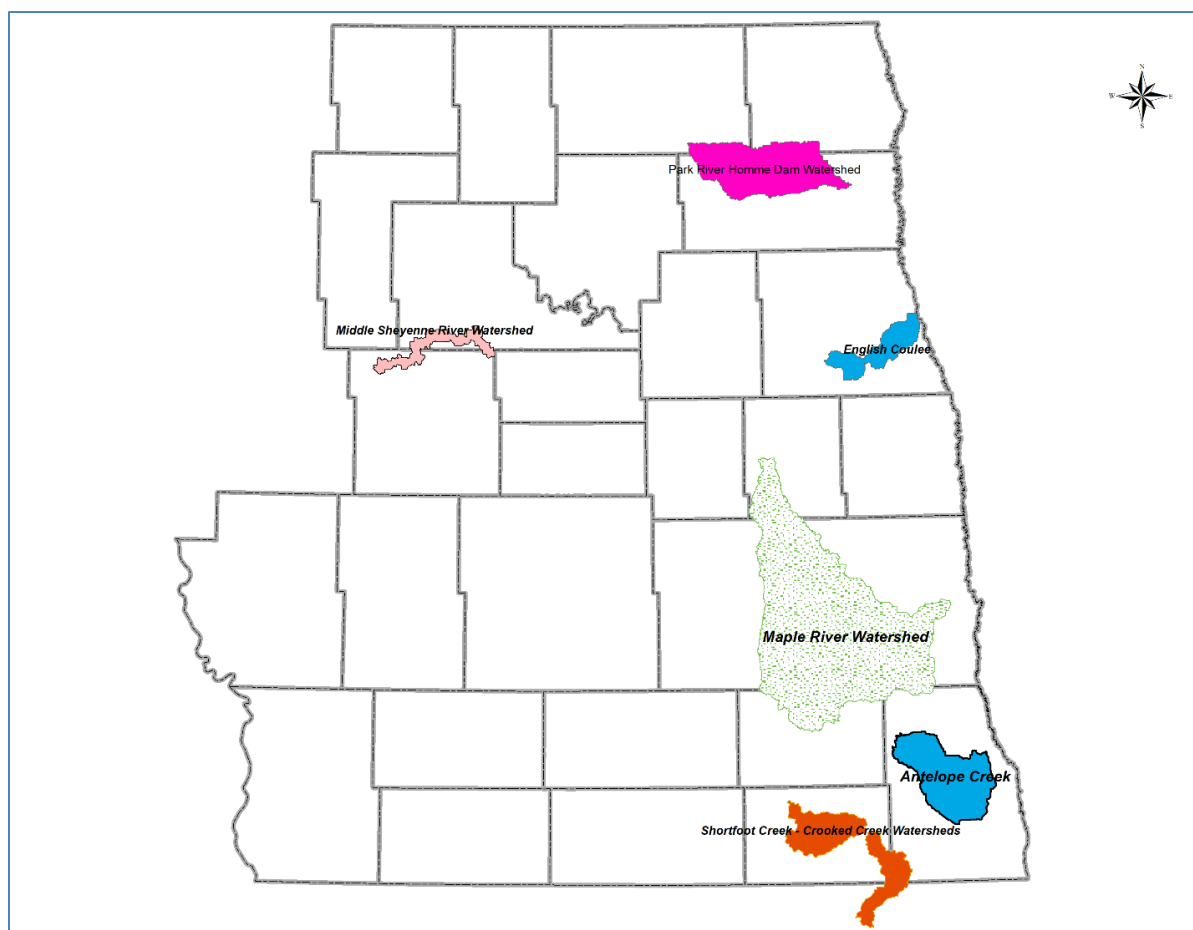


Figure 9. Active North Dakota Watershed Projects in the Red River Basin.

In addition to the watershed projects, the NPS Program also provides Section 319 financial support to several educational projects conducting outreach efforts in the Red River Basin. In general, these educational projects are disseminating information on NPS pollution impacts as well as the solutions to those impacts. The target audiences for these educational events range from K-12 students to the public at large. However, given the extent of the agricultural industry in the state, agricultural producers are typically the primary target audience for most NPS Program educational efforts. Table 10 lists the specific educational projects currently active in the Red River Basin.

Table 10. Educational projects supported by the NPS Program in the Red River Basin

| Section 319 Funded Education Project | Section 319 Funded Education Project |
|--|--|
| Statewide ECO ED Program | Envirothon Program |
| Ranchers Mentoring and Outreach Program | Red River Basin River Watch and River of Dreams Program. |
| Project WET | Prairie Waters Education & Research Center |
| Soil Conservation and Watershed Leadership Academy | The Regional Environmental Education Series (TREES) |
| Nutrient Management Education & Support Program | |

A third category of projects supported by the NPS Program includes projects that are providing technical support to other NPS projects or focusing on a specific priority resource concern. Collectively, these projects are identified as “support projects.” The support projects are generally statewide or regional in scale. Five support projects are currently active in the Red River Basin. While the scope of these projects extends beyond the Red River Basin, they have assisted with the promotion and/or implementation of BMPs in the basin. Summaries of the support projects are as follows:

- The ND Department of Agriculture has been awarded Section 319 funding since 2010 to support the Livestock Pollution Prevention Program (LP3). The goal of the program is to deliver a statewide program that will reduce water quality impairments associated with concentrated livestock feeding areas. This is being accomplished by providing planning assistance to livestock producers to design and install manure management systems. Some of the practices being installed include diversions, dikes, fencing, holding ponds, vegetative buffers, and settling basins. Since 2010 the LP3 has provided financial and technical assistance to implement seven full containment livestock manure management systems in the Red River Basin.
- Section 319 funds have been used by the Stockmen’s Association since 2001 to support the ND Stockmen’s Association Environmental Services Program. The program goal is to deliver a statewide program that addresses water quality impairments associated with concentrated livestock feeding areas. To meet this goal, financial and technical assistance is provided to livestock producers to design and install full containment manure management systems. Assistance is also being provided to develop manure utilization plans for each feeding system. Practices that may be installed include diversions, dikes, fencing, holding ponds, vegetative buffers, and settling basins. To date, the Environmental Services Program has assisted with the implementation of one manure management system in the Red River Basin.
- Pheasants Forever, Inc. was awarded Section 319 funding in 2017 and 2020 to implement the Precision Ag Business Planning Support Program. The goal of the program is to utilize precision ag business planning technology, delivered through several Return on Investment Platforms, to improve water quality and wildlife habitat while maximizing farm profits and minimizing risks for participating producers. This is being accomplished by providing technical assistance to producers to evaluate their fields and identify areas of low or negative profits. Using this information, project staff coordinate with local SCD and/or NRCS staff to assist producers in determining alternative uses for the revenue negative acres. The management objective for the targeted acres is to implement practices that will improve producer profits; eliminate unnecessary nutrient and/or pesticide inputs; protect the soil resource; and reduce potential water quality impacts. Typically, the management adjustments on the revenue negative acres include enrollment in the Conservation Reserve Program or, for more short-term practices, planting annual cover crops, perennial forage crops or native grasses. Counties in the Red River Basin where the program is being implemented include Ransom, Sargent, Richland and Barnes counties.

- The International Water Institute (IWI) was allocated Section 319 funding in 2017 and 2018 to support the development and management of the Prioritize, Target and Measure Application (PTMApp) for the Red River Valley in ND. The NRCS has also contributed significant funding to support the development of the PTMApp in the state. The PTMApp provides the means to develop water quality geo-spatial data products at very fine scales. Using the web-based PTMApp, these data can be used by local resource managers and landowners to establish watershed and field scale priorities; identify specific fields for BMP implementation; and estimate nutrient and sediment load reductions delivered to downstream lakes, reservoirs, rivers and streams. The tool provides a readily available means to: 1) evaluate water quality benefits of different watershed improvement plans; 2) estimate the cost-effectiveness of potential practices for improving water quality; and 3) generate a report of “preferred” options to aid in developing watershed-based plans. Development of PTMApp has been completed for the Wild Rice, Park, Sheyenne, Forest, Bois de Sioux, Turtle, Elm, Wilson and Goose River watersheds in the Red River Basin in ND. The long-term goal is to have PTMApp completed for all the ND watersheds in the Red River Basin. The web address for the ND PTMApp is <https://nd.ptmapp.iwinst.org/>.
- Section 319 funds were awarded to the North Dakota State University in 2012 and 2016 to support the Riparian Complex Ecological Site Description Development project. The goal of the project is to develop riparian complex ecological site descriptions (RCESDs) and state-and-transition models (STMs) for major watersheds in the state. Outreach and training on the use of the RCESDs and STMs will also be conducted to improve the ability of local, state and federal resource managers and landowners to restore and/or properly manage riparian ecosystems. The RCESDs describe potential states and phases associated with a stream and describe drivers of transitions between states and phases; allowing the landowners and/or land managers to 1) identify, 2) assess, 3) predict change, 4) manage, 5) restore, 6) and monitor riparian ecosystems under their management. Within the Red River Basin, a RCESD and STM has been completed for the Sheyenne Watershed/Baldhill Creek.

8.0 BIOLOGICAL MONITORING IN THE RED RIVER BASIN

8.01 Macroinvertebrates of the Red River in Manitoba

Benthic macroinvertebrates were collected at two locations on the Red River in September 2019: Emerson and Selkirk (Table 11). At each location, one transect of five dredge grab samples were collected with a petit Ponar dredge. Starting at the east bank, samples were collected at five equidistant sample sites across the width of the river channel. Each Ponar dredge covered an area of 0.023 m². For each transect, 0.115 m² of sediment was collected. The dredge samples were washed through 500 µm Nitex nylon nets. River water was used to remove organisms and sediment from the nylon net into a 500 µm mesh sieve. Remaining sediment and all organisms were then placed in labelled 500 mL jars with 70 % ethyl alcohol preservative. Macroinvertebrates were subsequently identified to the lowest possible taxonomic level, typically genus and species, by ALS Environmental in Winnipeg, Manitoba. Data were screened for terrestrial species which were removed from the data subsequently reported.

Table 11. Geographic coordinates for the benthic macroinvertebrates sampling stations at Emerson and Selkirk on the Red River, Manitoba in September 2019.

| Transect | Latitude | Longitude |
|----------|-------------|-------------|
| Emerson | 49°00'13.6" | 97°13'16.2" |
| Selkirk | 50°08'55.7" | 96°51'24.8" |

In 2019 at Emerson, 114 organisms were collected. To calculate organisms per square metre, the number of organisms at each transect was multiplied by a factor of 8.70, yielding 992 organisms/m² (Table 12). For the reporting period at Emerson in 2019, the organisms in greatest abundance were from the Order Trichoptera (Family Hydropsychidae). The second most abundant type of organisms present were from the Order Diptera (Family Chironomidae). Overall, the total number taxa present, as well as the total number of organisms was greater for the current reporting period compared to the previous period. However, while the total number of organisms was greater in the 2019 period compared to 2018, the total number of organisms observed in 2019 was largely driven by two species of insect taxa, representing 83 per cent of all organisms collected.

In the Red River at Selkirk, 166 organisms were collected. To calculate organisms per square metre, the number of organisms at each transect was multiplied by a factor of 8.70, yielding 1444 organisms/m² (Table 13). For the 2019 reporting period at Selkirk, the organisms of greatest abundance were from the Order Diptera (Family Chironomidae). The second most abundant type of organisms present were from the Class Annelida, Order Oligochaeta, Family Tubificidae. Contrary to the trend observed at the Emerson site in 2019, the total number of benthic invertebrate organisms observed at Selkirk was less than half of the total organisms collected in 2018, however, the total number of taxa observed remained similar to 2018 (22 taxa versus 25 taxa, respectively).

Overall, the Red River at Selkirk had a greater species richness of benthic macroinvertebrates in 2019 than did the portion of the Red River near Emerson. The Red River near Selkirk had both a higher number of total organisms present, as well as, a greater amount of different invertebrates taxas represented in the samples.

Table 12 Summary of macroinvertebrates collected per transect and calculated total per metre squared in pooled Ponar © dredge samples from the Red River at Emerson, Manitoba in September 2019.

| Class | Order | Family | Genus | Species | Number per transect |
|-------------------------------|--------------|---------------|-------------------|--------------------|---------------------|
| ANNELIDA | OLIGOCHAETA | TUBIFICIDAE | unidentified | without hair setae | 7 |
| CRUSTACEA | COPEPODA | CALANOIDA | | | 1 |
| CRUSTACEA | COPEPODA | CYCLOPOIDA | | | 1 |
| INSECTA | COLEOPTERA | ELMIDAE | Stenelmis | sp. | 1 |
| | | | unidentified | | |
| INSECTA | COLEOPTERA | ELMIDAE | larva | damaged | 1 |
| | | | unidentified | | |
| INSECTA | COLEOPTERA | HETEROCERIDAE | adult | | 1 |
| INSECTA | COLLEMBOLA | ISOTOMIDAE | Isotomurus | palustris | 1 |
| INSECTA | DIPTERA | | unidentified pupa | | 1 |
| INSECTA | DIPTERA | CHIRONOMIDAE | Axarus | sp. | 43 |
| | | | Cryptochironom | | |
| INSECTA | DIPTERA | CHIRONOMIDAE | us | sp. | 1 |
| | EPHEMEROPTER | | | | |
| INSECTA | A | EPHEMERIDAE | Ephemera | sp. | 1 |
| | EPHEMEROPTER | | unidentified | | |
| INSECTA | A | HEPTAGENIIDAE | nymph | damaged | 1 |
| | | HYDROPSYCHIDA | | | |
| INSECTA | TRICHOPTERA | E | Potamyia | sp. | 50 |
| INSECTA | TRICHOPTERA | HYDROPTILIDAE | unidentified | too young to ID | 1 |
| NEMATODA | | | unidentified | | 2 |
| PELECYPOD | | | | | |
| A | VENEROIDA | PISIIDAE | unidentified | too young to ID | 1 |
| Total number of organisms | | | | | 114 |
| Total number per square meter | | | | | 992 |
| Total number of taxa | | | | | 16 |

Table 13. Summary of macroinvertebrates collected per transect and calculated total per metre squared in pooled Ponar © dredge samples from the Red River at Selkirk, Manitoba in September 2019.

| Class | Order | Family | Genus | Species | Number per transect |
|-------------------------------------|-----------------|-----------------|-------------------------|---------------------------|---------------------|
| ANNELIDA | OLIGOCHAETA | NAIDIDAE | <i>Nais</i> | <i>sp.</i> | 6 |
| ANNELIDA | OLIGOCHAETA | TUBIFICIDAE | <i>Branchiura</i> | <i>sowerbyi</i> | 5 |
| ANNELIDA | OLIGOCHAETA | TUBIFICIDAE | <i>unidentified</i> | <i>with hair setae</i> | 39 |
| ANNELIDA | OLIGOCHAETA | TUBIFICIDAE | <i>unidentified</i> | <i>without hair setae</i> | 117 |
| CRUSTACEA | AMPHIPODA | HYALELLIDAE | <i>Hyalella</i> | <i>azteca</i> | 1 |
| CRUSTACEA | COPEPODA | CALANOIDA | | | 2 |
| CRUSTACEA | COPEPODA | CYCLOPOIDA | | | 1 |
| CRUSTACEA | DECAPODA | CAMBARIDAE | <i>Orconectes</i> | <i>sp.</i> | 1 |
| CRUSTACEA | OSTRACODA | | | | 4 |
| GASTROPODA | NEOTAENIOGLOSSA | HYDROBIIDAE | <i>Amnicola</i> | <i>limosa</i> | 6 |
| GASTROPODA | | | <i>unidentified</i> | <i>too young to ID</i> | 2 |
| INSECTA | COLEOPTERA | ELMIDAE | <i>Dubiraphia</i> | <i>sp.</i> | 2 |
| INSECTA | DIPTERA | CERATOPOGONIDAE | | | 4 |
| INSECTA | DIPTERA | CHIRONOMIDAE | <i>Axarus</i> | <i>sp.</i> | 7 |
| INSECTA | DIPTERA | CHIRONOMIDAE | <i>Chironomus</i> | <i>sp.</i> | 18 |
| INSECTA | DIPTERA | CHIRONOMIDAE | <i>Ceolotanypus</i> | <i>sp.</i> | 4 |
| INSECTA | DIPTERA | CHIRONOMIDAE | <i>Cryptochironomus</i> | <i>sp.</i> | 8 |
| INSECTA | DIPTERA | CHIRONOMIDAE | <i>Polypedilum</i> | <i>sp.</i> | 5 |
| INSECTA | DIPTERA | CHIRONOMIDAE | <i>Procladius</i> | <i>sp.</i> | 5 |
| INSECTA | EPHEMEROPTERA | EPHEMERIDAE | <i>Hexagenia</i> | <i>limbata</i> | 43 |
| INSECTA | TRICHOPTERA | HYDROPSYCHIDAE | <i>Potamyia</i> | <i>sp.</i> | 1 |
| INSECTA | TRICHOPTERA | LEPTOCERIDAE | <i>Oecetis</i> | <i>sp.</i> | 4 |
| PELECYPODA | VENEROIDA | PISIIDAE | <i>Pisidium</i> | <i>sp.</i> | 1 |
| PELECYPODA | VENEROIDA | PISIIDAE | <i>Sphaerium</i> | <i>sp.</i> | 58 |
| PELECYPODA | VENEROIDA | PISIIDAE | <i>unidentified</i> | <i>Too young to ID</i> | 1 |
| Total number of organisms | | | | | 166 |
| Total number per meter ² | | | | | 1444 |
| Total number of taxa | | | | | 22 |

8.02 Benthic Invertebrate Indices: Simpsons Evenness, EPT taxa, and Bray-Curtis Dissimilarity Index.

Simpsons Diversity Index (D) (Krebs, 1994) places little weight on rare taxa and more weight on common species and is calculated.

$$D = 1 - \sum_{i=1}^s (p_i)^2$$

Where S total number of species in the community (richness), p_i proportion of S made up of the i th species. D ranges from zero to one, indicating a low to high level of diversity. Calculated Diversity scores for Emerson and Selkirk were 0.67 and 0.76 respectively.

Simpsons equitability or Evenness (E) indicates if taxa are evenly represented within a given sample. Evenness varies from a score of zero to one. A score of one represents a sample in which all the taxa are equally abundant (Smith and Wilson 1996). Evenness is calculated by

$$E_p = \frac{D}{D_{\max}} = \frac{1}{\sum_{i=1}^s p_i^2} \times \frac{1}{S}$$

where:

E = evenness

p_i = the proportion of the i th taxon at the station

S = the total number of taxa at the station

Simpsons Evenness scores were 0.004 and 0.003 for the Red River at Emerson and Selkirk respectively. The Evenness score for both sites was influenced by relatively small numbers of individuals from many taxa.

The EPT Index is named for three orders of aquatic insects that are common in the benthic macroinvertebrate community including pollution intolerant Ephemeroptera (mayflies), Plecoptera (stoneflies), and generally pollution tolerant order Trichoptera (caddisflies). EPT taxa richness will decrease with decreasing water quality. The EPT score is the sum of the number of species from within these groups. The EPT score for Emerson was 4 and Selkirk was 1. No individuals from the pollution intolerant Order Plecoptera were found at Emerson or Selkirk. Percent EPT is the total number of EPT individuals divided by the total number of individuals in the sample. Percent EPT was 6 percent for Emerson and 1 percent for Selkirk. Overall, relatively low numbers of EPT individuals were observed at either sites during the 2018-2019 report period.

The Bray-Curtis Index compares the community composition of two sites where the co-efficient reaches a maximum of 1 for two sites that are entirely different and a minimum score of 0 for sites that possess identical composition (Legendre and Legendre, 1983). The calculated Bray-Curtis Dissimilarity Index was 0.91 indicating that community compositions were different between sites. In particular, there was a much greater diversity of taxonomic families observed at Selkirk compared to Emerson (22 and 16 respectively), as well as, a greater abundance of total organisms

at Selkirk compared to Emerson (166 and 114 organisms collected respectively). Overall, 6 taxonomic groups were observed at both sites, while 10 groups and 16 groups were only observed at Emerson and Selkirk, respectively (Tables 3 and 4).

References:

Krebs, C.J. 1994 Ecology: The Experimental Analysis of Distribution and Abundance, 4th Ed. Harper Collins, New York. P. 705-706.

Legendre, L., and P. Legendre. 1983. Numerical ecology. Elsevier, Amsterdam.

Smith, B. and J. Wilson. 1996. A consumer's guide to evenness indices. - Oikos. 76: 70-82.

8.03 *Escherichia coli* and Algal Bloom Monitoring in Lake Winnipeg

Manitoba monitored nineteen recreational beaches within the south basin of Lake Winnipeg for levels of *Escherichia coli* during 2019 (Figure 10). Sampling began at the beginning of June and continued weekly until the end of August.

While some beaches occasionally exceeded Manitoba's recreational water quality guideline for fecal indicator bacteria, typically recreational water quality is excellent at Lake Winnipeg beaches. All beaches have a blue coloured "Clean Beaches" sign that provides information to bathers about *E. coli* and identifies precautions on how the bathing public can reduce risk of exposure to pathogens. For beaches that had *E. coli* densities above the guideline and that have a history of elevated densities, additional yellow coloured 'Beach Advisory' signs were posted. Results of DNA ribotyping from 2002 to 2006 indicated that approximately 34 per cent of *E. coli* from all samples could be attributed to shorebirds and geese, while less than 5 per cent of the samples could be attributed to human sources. Thirty-seven per cent of the *E. coli* samples could not be matched to a particular animal source.

As part of the 2019 beach monitoring program, Manitoba Agriculture and Resource Development continued to monitor beaches on Lake Winnipeg for the presence of algal blooms. On Lake Winnipeg, East Grand Beach, Hillside Beach, Albert Beach and Victoria Beach (at two beaches) were posted with first level algal advisories indicating the number of blue-green algae cells exceeded the Manitoba recreational water quality objective of 100,000 cells per mL. The first level algal advisory informs bathers that algal blooms have been observed at the beach and provides some additional advice regarding avoiding contact with the water when algal blooms are present. The second level algal toxin advisory is posted when the concentration of microcystin exceeds the Manitoba recreational water quality objective of 20 µg/L. The advisory indicates that drinking, swimming or other contact with the water is not recommended. In 2019, there were no beaches on

Lake Winnipeg posted with second level algal advisory signs.



Figure 10. Map of beach monitoring locations on Lake Winnipeg as a part of the Clean Beaches Program.

8.04 Fisheries of the Red River in Manitoba

Biological Information

A total of 67 fish species have been recorded in the Manitoba portion of the Red River (Table 14). Presently, Bigmouth Buffalo (*Ictiobus cyprinellus*) and Chestnut Lamprey (*Ichthyomyzon castaneus*) are designated as Special Concern under *The Species at Risk Act*. In 2005 and 2017, Lake Sturgeon (*Acipenser fulvescens*) was recommended for listing as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Known aquatic invasive species that have been introduced in the Manitoba portion of the Red River include the Common Carp (*Cyprinus carpio*), White Bass (*Morone chrysops*), Rainbow Smelt (*Osmerus mordax*) and Asian Carp Tapeworm (*Bothriocephalus acheilognathi*). Other introductions into the Manitoba portion of the Red River include feral Goldfish (*Carassius auratus*), Smallmouth Bass (*Micropterus dolomieu*) and Largemouth Bass (*Micropterus salmoides*).

Zebra Mussel (*Dreissena polymorpha*) veligers were detected in the Manitoba portion of the Red River for the first time in samples collected on June 9th, 2015 at Emerson and a second sampling location at Selkirk. Zebra Mussel veligers were subsequently found in the U.S.A. portion of the Red River. In early May 2015, adult Zebra Mussels were reported from a dock located in an offshoot of the Red River near Selkirk Park. This was the first detection of adult Zebra Mussels in the entirety of the Red River. Subsequently, Zebra Mussel veligers were found throughout the length of the Manitoba portion of the Red River and the channel region and the north basin of Lake Winnipeg. Zebra Mussel veligers were also found in Cedar Lake, Manitoba, a hydro-electric

impoundment located immediately upstream from Lake Winnipeg on the Saskatchewan River system. In 2020, adult Zebra Mussels are found throughout Lake Winnipeg and downstream as far as Sipiwesk Lake.

Manitoba has increased its efforts to minimize the spread of Zebra Mussels from Lake Winnipeg and the Red River to other water bodies by operating more watercraft inspection stations, developing legislation and increasing communication initiatives. Monitoring within Lake Winnipeg is ongoing to determine the range and rate of spread of this species.

Recreational Angling - Value

The Manitoba portion of the Red River is internationally known for the high quality of angling the fishery supports. Based on a 2010 Angler Survey, Manitobans and visitors to the province fished a total of 2 million days, of which 11% were spent on the Red River, and 8% on Lake Winnipeg, making these the most heavily fished water bodies in the province. It is estimated that anglers fishing the Red River and Lake Winnipeg contributed approximately \$70M towards the overall economic value of angling in Manitoba (\$407M annually based on the 2012 Travel Manitoba report “Economic Evaluation of Manitoba’s Hunting and Fishing Industry”). A partial winter creel survey was conducted on Lake Winnipeg in winter 2017 and confirmed the continuing and rapid expansion of angling on the south basin of Lake Winnipeg. Between January 23 and February 23, 2017 more than 66,000 angler visits to the lake were reported. A second partial south basin creel survey was conducted in 2018. An analysis of this survey is underway.

The Red River fishery attracts non-residents primarily to trophy Walleye and Channel Catfish angling opportunities. The diverse fish species composition appeals to residents of all ages. From an angling perspective, the fishery is managed to: 1) ensure sustainability of the recreational fishery for future generations, 2) encourage angler participation and development of the recreational fishing potential of the river, and 3) maximize economic returns to angling interests who rely on the fishery for their livelihood.

The majority of angling effort occurs between the floodway gate structure at St. Norbert and the north end of the south basin of Lake Winnipeg. Angling is especially concentrated from the dam at Lockport downstream to Netley Creek, within the City of Winnipeg and along the shore of the south basin.

A commercial net fishery targeting primarily Walleye and Lake Whitefish has operated on Lake Winnipeg since the late 1800s. The Lake Winnipeg fishery comprises more than 50% of the value of all of Manitoba’s commercial fisheries and is valued at approximately \$50M annually.

Table 14. Fish species of the Red River in Manitoba.

Note: * = indicates species at risk, + = indicates introduced species

| Common Name | Genus | Species | Presence | Common Name | Genus | Species | Presence |
|--------------------|--------------------|-----------------------|----------|-----------------------|--------------------|-------------------|----------|
| Banded Killifish | <i>Fundulus</i> | <i>diaphanus</i> | Rare | Largemouth Bass + | <i>Micropterus</i> | <i>salmoides</i> | Uncommon |
| Bigmouth Buffalo * | <i>Ictiobus</i> | <i>cyprinellus</i> | Common | Logperch | <i>Percina</i> | <i>caprodes</i> | Common |
| Bigmouth Shiner | <i>Notropis</i> | <i>Dorsalis</i> | Unknown | Longnose Dace | <i>Rhinichthys</i> | <i>cataractae</i> | Unknown |
| Black Bullhead | <i>Ameiurus</i> | <i>Melas</i> | Common | Longnose Sucker | <i>Catostomus</i> | <i>catostomus</i> | Common |
| Black Crappie | <i>Pomoxis</i> | <i>nigromaculatus</i> | Common | Mimic Shiner | <i>Notropis</i> | <i>volucellus</i> | Unknown |
| Blackchin Shiner | <i>Notropis</i> | <i>heterodon</i> | Unknown | Mooneye | <i>Hiodon</i> | <i>tergisus</i> | Rare |
| Blacknose Shiner | <i>Notropis</i> | <i>heterolepis</i> | Unknown | Ninespine Stickleback | <i>Pungitius</i> | <i>pungitius</i> | Common |
| Blackside Darter | <i>Percina</i> | <i>Maculate</i> | Unknown | Northern Pike | <i>Esox</i> | <i>lucius</i> | Common |
| Bluntnose Minnow | <i>Pimephales</i> | <i>Notatus</i> | Unknown | Pearl Dace | <i>Margariscus</i> | <i>margarita</i> | Unknown |
| Brassy Minnow | <i>Hybognathus</i> | <i>hankinsoni</i> | Unknown | Quillback | <i>Carpiodes</i> | <i>cyprinus</i> | Uncommon |
| Brook Stickleback | <i>Culaea</i> | <i>inconstans</i> | Common | Rainbow Smelt + | <i>Osmerus</i> | <i>mordax</i> | Uncommon |
| Brown Bullhead | <i>Ameiurus</i> | <i>nebulosus</i> | Common | River Darter | <i>Percina</i> | <i>shumardi</i> | Common |
| Burbot | <i>Lota</i> | <i>Lota</i> | Common | River Shiner | <i>Notropis</i> | <i>blennius</i> | Unknown |
| Central Mudminnow | <i>Umbra</i> | <i>Limi</i> | Common | Rock Bass | <i>Ambloplites</i> | <i>rupestris</i> | Common |
| Channel | <i>Ictalurus</i> | <i>punctatus</i> | Common | Rosyface Shiner | <i>Notropis</i> | <i>rubellus</i> | Unknown |

| | | | | | | | |
|--------------------|---------------------|----------------------|----------|------------------------|---------------------|-----------------------|----------|
| Catfish | | | | | | | |
| Chestnut Lamprey * | <i>Ichthyomyzon</i> | <i>castaneus</i> | Unknown | Sand Shiner | <i>Notropis</i> | <i>stramineus</i> | Uncommon |
| Cisco | <i>Coregonus</i> | <i>Artemis</i> | Common | Sauger | <i>Sander</i> | <i>canadensis</i> | Common |
| Common Carp + | <i>Cyprinus</i> | <i>Carpio</i> | Common | Shorthead Redhorse | <i>Moxostoma</i> | <i>macrolepidotum</i> | Common |
| Common Shiner | <i>Luxilus</i> | <i>Cornutus</i> | Rare | Silver Chub | <i>Macrhybopsis</i> | <i>storeriana</i> | Common |
| Creek Chub | <i>Semotilus</i> | <i>atromaculatus</i> | Unknown | Silver Lamprey | <i>Ichthyomyzon</i> | <i>unicuspis</i> | Unknown |
| Emerald Shiner | <i>Notropis</i> | <i>atherinoides</i> | Abundant | Silver Redhorse | <i>Moxostoma</i> | <i>anisurum</i> | Common |
| Fathead Minnow | <i>Pimephales</i> | <i>Promelas</i> | Common | Smallmouth Bass + | <i>Micropterus</i> | <i>dolomieu</i> | Unknown |
| Flathead Chub | <i>Platygobio</i> | <i>Gracilis</i> | Unknown | Spotfin Shiner | <i>Cyprinella</i> | <i>spiloptera</i> | Unknown |
| Freshwater Drum | <i>Aplodinotus</i> | <i>grunniens</i> | Abundant | Spottail Shiner | <i>Notropis</i> | <i>hudsonius</i> | Common |
| Golden Redhorse | <i>Moxostoma</i> | <i>erythrurum</i> | Rare | Stonecat | <i>Noturus</i> | <i>flavus</i> | Unknown |
| Golden Shiner | <i>Notemigonus</i> | <i>crysoleucas</i> | Unknown | Tadpole Madtom | <i>Noturus</i> | <i>gyrinus</i> | Common |
| Goldeye | <i>Hiodon</i> | <i>Alosoides</i> | Common | Troutperch | <i>Percopsis</i> | <i>omiscomaycus</i> | Common |
| Goldfish + | <i>Carassius</i> | <i>Auratus</i> | Unknown | Walleye | <i>Sander</i> | <i>vitreus</i> | Common |
| Hornyhead Chub | <i>Nocomis</i> | <i>biguttatus</i> | Unknown | Western Blacknose Dace | <i>Rhinichthys</i> | <i>obtusum</i> | Unknown |
| Iowa Darter | <i>Etheostoma</i> | <i>Exile</i> | Common | White Bass + | <i>Morone</i> | <i>chrysops</i> | Common |
| Johnny Darter | <i>Etheostoma</i> | <i>Nigrum</i> | Common | White Crappie | <i>Pomoxis</i> | <i>annularis</i> | Unknown |
| Lake Chub | <i>Couesius</i> | <i>plumbeus</i> | Rare | White Sucker | <i>Catostomus</i> | <i>commersoni</i> | Common |
| Lake Whitefish | <i>Coregonus</i> | <i>clupeaformis</i> | Uncommon | Yellow Perch | <i>Perca</i> | <i>flavescens</i> | Common |
| Lake Sturgeon * | <i>Acipenser</i> | <i>fulvescens</i> | Rare | | | | |

9.0 ADDITIONAL ACTIVITIES IN THE RED RIVER BASIN

As outlined in Appendix A – International Red River Board Directive, the duties of the Board include maintaining an awareness of agencies in the basin, of developments and conditions that may affect water levels and flows, water quality and ecosystem health of the Red River and its transboundary tributaries, and activities that contribute to a better understanding of the aquatic ecosystems. Chapter 9 provides an overview of a number of relevant activities and developments in the basin.

9.01 Garrison Diversion Project - Dakota Water Resources Act

The Dakota Water Resources Act (DWRA) of December 2000 amended authorizing legislation for the Garrison Diversion Project. The legislation outlines a program to meet Indian and non-Indian water supply needs in North Dakota and authorizes water uses including municipal, rural and industrial, fish and wildlife, recreation, irrigation, flood control, stream flow augmentation, and ground water recharge.

Red River Valley Water Supply Project (RRVWSP)

The Garrison Diversion Conservancy District (GD CD) is the project's state sponsor, while the Lake Agassiz Water Authority (LAWA) represents the local users. The project is designed to provide a supplemental water supply during times of water scarcity to central and eastern North Dakota. The project, as envisioned by the GD CD, will also supply additional water to support industrial development as well as provide an environmental benefit by augmenting natural stream flows (Figure 11 and Figure 12).

Thirty-five cities and water systems have committed to help fund the development portion of the project. A capacity of about 159 cfs would be needed to service these interests. The current estimated cost of the project is \$1.19 billion, for 165 cfs project capacity.

Legislative Mandate

State Budget (SB) 2020, passed during the 2019 ND Legislative session, directs the ND State Water Commission (ND SWC) to provide, in the form of a grant, up to \$30 million for the project, with a cost share requirement of 75 percent state and 25 percent local. SB 2020 also includes \$13 million carryover grant funds from the 2017-19 budget for the project. Up to \$13 million is to initiate construction of phase one prioritized project features to the Garrison Diversion Conservancy District for the Red River Valley Water Supply Project, for the biennium beginning the effective date in 2019 and ending June 30, 2021. The bill also established the following requirements for this funding.

1. Any funding received for the completion of the planning and permitting process of the Red River valley water supply (RRVWS) project must result in the following accomplishments:
 - a. The completed RRVWS project plan document that will be the basis and justification for project construction and must include alternative selection, water supply needs, projected project costs, easement acquisitions,

- environmental regulation compliance to include issuance of a final national pollutant discharge elimination system permit, and acquisition of all state and federal permits required for the construction of any project features intended to be constructed with funding provided during the 2019-21 biennium;
- b. A signed Bureau of Reclamation water service contract agreeing to a minimum of one hundred sixty-five cubic feet per second over a minimum of forty years or equivalent to ensure an adequate water source for the project's needs;
 - c. Prioritized project features for phase one construction; and
 - d. A recommendation for funding options for all phases of the RRVWS project.
2. Any funding received to initiate construction of phase one prioritized project features identified in subsection 1 may be spent and construction of phase one may begin only after the budget section receives and approves certification from the state water commission and the state engineer that all items listed in subsection 1 have been accomplished.
 3. Quarterly progress reports on the RRVWS project from the Garrison Diversion Conservancy District to the water topics overview committee of the legislative management, during the 2019-21 interim.

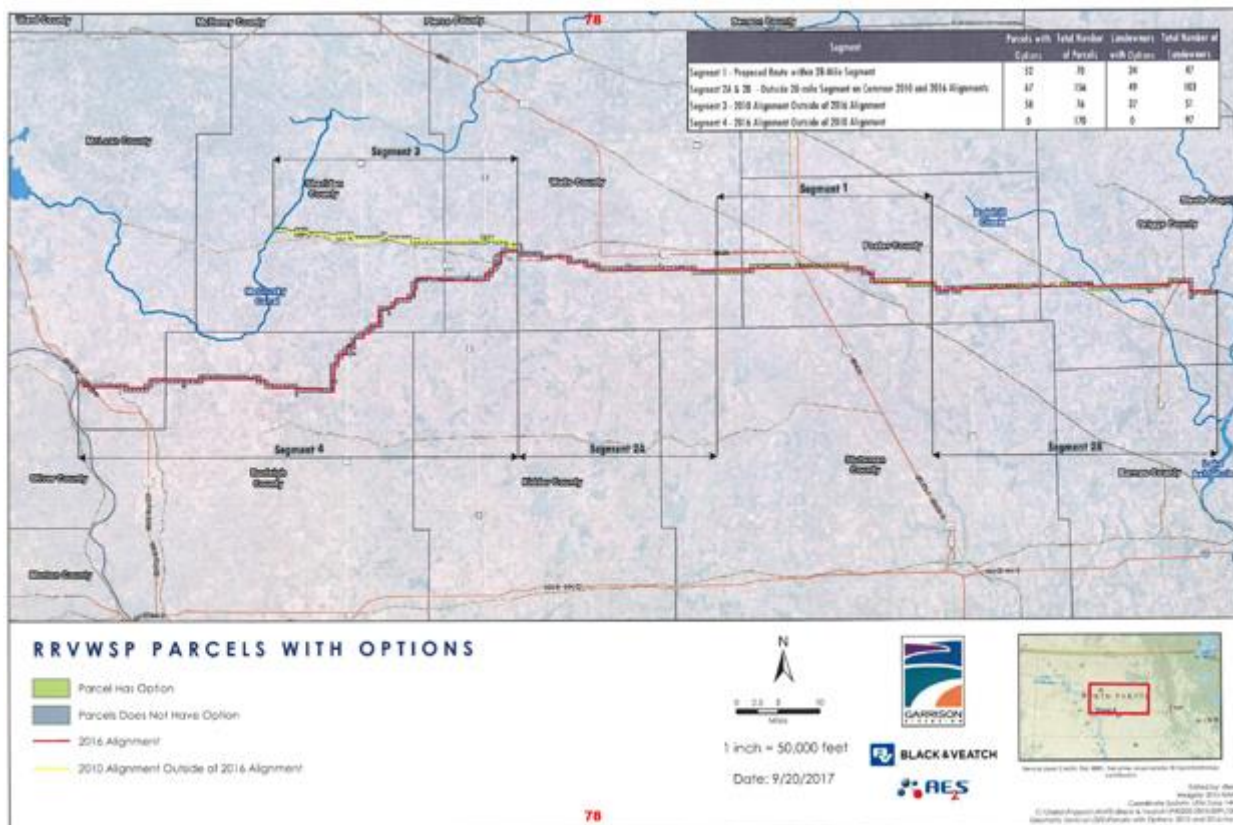


Figure 11: Proposed Route for the RRVWSP

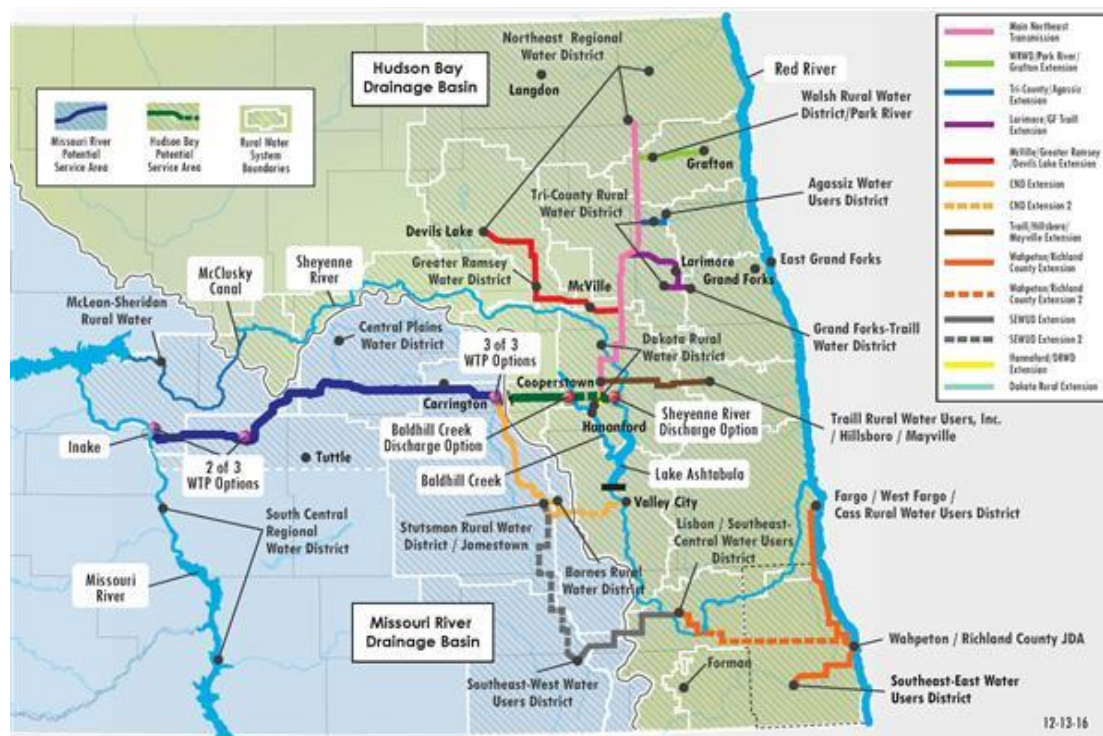


Figure 12: 35 Water Systems Shown That Have Signed Development Agreements

Design/Construction:

Phased final design is underway. Priority items for the phased final design and construction are the discharge structure, trenchless crossings, and portions of the intake.

Other priorities include: exercise existing options, acquire remaining easement options, acquire state and federal permits, secure water source, complete the final design of strategic lengths of the pipeline for construction, complete final design for the Missouri River intake and discharge structures, and start construction of key components.

The first segment of pipeline to be designed and prepared for construction is a 28-mile length located on the Missouri River side of the divide. The phased design of the trenchless crossings will also be located within this 28-mile section.

The majority of the remaining project work is planned to be bid and constructed from 2020 to 2029. Major components of the design and construction include: Pipeline alignment McClusky to the split; Missouri River Conventional Intake/COE Permit; Financial Modeling; Pipeline alignment Washburn to McClusky; Pipeline alignment split to Baldhill Creek; Main Pumping Station, Pre-Treatment, Break Tank, Control Valve Structure, Hydraulics and Tansient – Preliminary Engineering; Aerial Photography and LIDAR Services; StateMod Water Supply Model; Pipeline Extensions; and Discharge Structure Design.

At the April 9, 2019 meeting, the ND SWC approved 120,000 acre-feet per year at a rate of 165 cubic feet per second from SWC Water Permit #1416A be assigned to the GDCD for the purpose of supplying water to the RRVWSP from the Missouri River.

Construction is planned to begin on three parts of the pipeline in 2020: an intake on the Missouri River near Washburn, N.D., preparations for a 28-mile segment of pipeline and an outlet that will discharge water into the Sheyenne River, which joins the Red River near Harwood.

The RRBC has facilitated meetings for further discussion on water treatment plant proposals.

A public notice to issue North Dakota Pollutant Discharge Elimination System (NDPDES) Discharge Permit was submitted by the North Dakota Department of Environmental Quality on March 23, 2020. A hearing was held on May 12, 2020. The comment period ended on May 21, 2020. The permit was signed on August 28, 2020.

Central North Dakota Water Supply Project

The project proposed to obtain a water service contract for 20 cfs from the McClusky Canal and to approve authorization of a preference power contract to Garrison Diversion (Figure 13). The water would serve industrial water needs in areas of Burleigh, Sheridan, Wells, Foster, Kidder, McLean, and Stutsman Counties within the Missouri River Basin, North Dakota. This proposal was analyzed through an Environmental Assessment, with a Finding of No Significant Impact issued in September 2018.

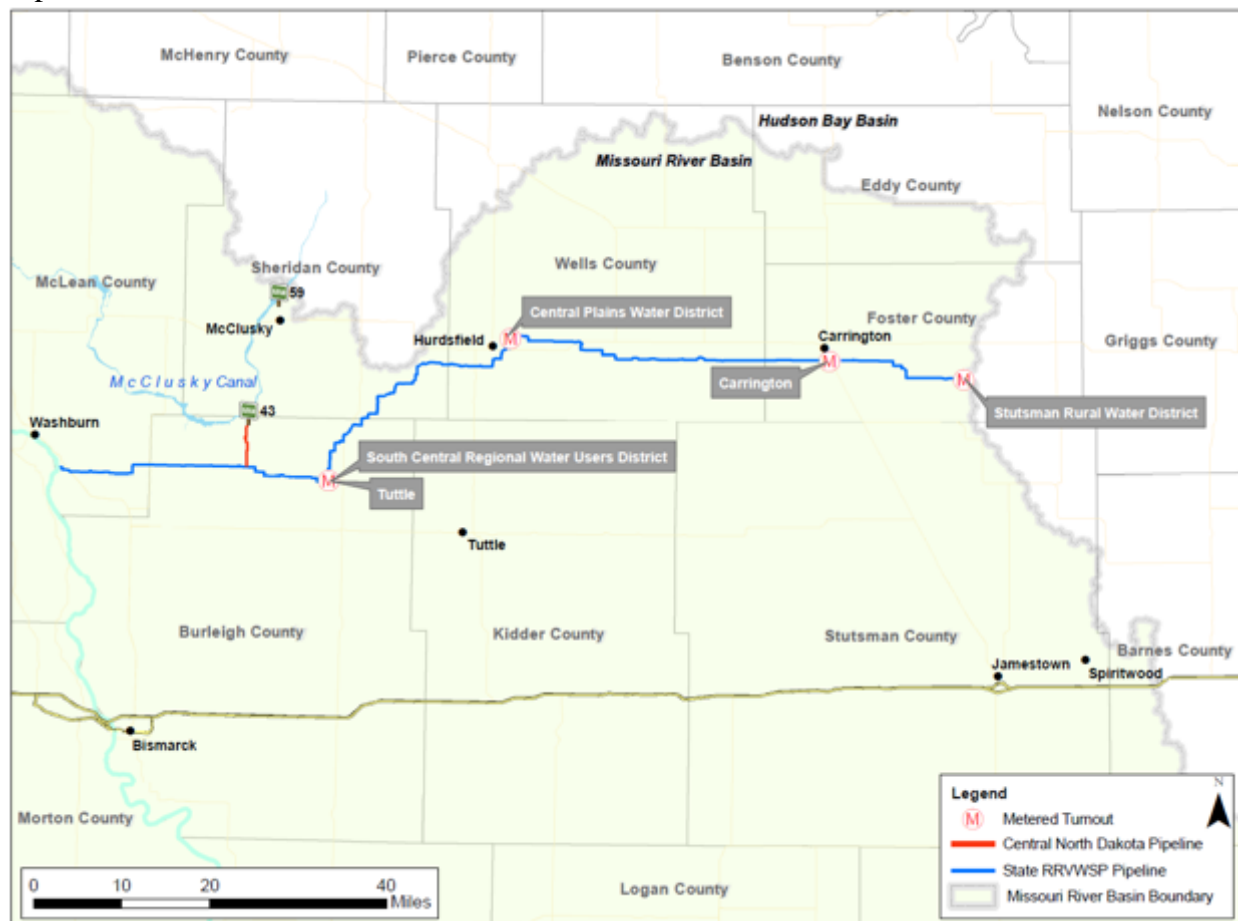


Figure 13: Overview of the Proposed Central North Dakota Pipeline Project and the State sponsored Red River Valley Water Supply Project.

Eastern North Dakota Alternate Water Supply Project (ENDAWS)

This proposal would deliver an alternate water supply for the Red River Valley Water Supply Project (RRVWS). This would include the use of the Snake Creek Pumping Plant, a portion of the McClusky Canal, and a bulk transmission pipeline to deliver water to the main transmission pipeline of the RRVWS (Figure 14). The request is for delivery of up to 165 cfs. It is estimated that using the McClusky Canal as an alternative water source could save millions of dollars in costs for construction, annual maintenance, and pumping.

The Bureau of Reclamation has prepared an Environmental Impact Statement (EIS) for the funding and construction of this proposed project. Reclamation is authorized to work with the State of North Dakota to plan, design and construct municipal, rural and industrial water supply projects. Reclamation is the lead federal agency and is responsible for ensuring compliance with the National Environmental Policy Act (NEPA).

Reclamation's potential actions include construction of ENDAWS project features, issuance of a water repayment contract for Garrison Diversion Unit facilities, issuance of permits to construct and maintain ENDAWS facilities on Reclamation rights-of-way, and compliance with the Boundary Waters Treaty of 1909.

Scoping meetings were held in October 2019. A notice of Intent was issued on November 13, 2019 and a draft EIS was released on May 22, 2020. A virtual public meeting was held on June 18, 2020, to receive comments on the draft EIS. The 45-day comment period for the draft EIS expired on July 6, 2020. It is anticipated that the final EIS will be completed in October 2020, with the Record of Decision completed in November 2020.

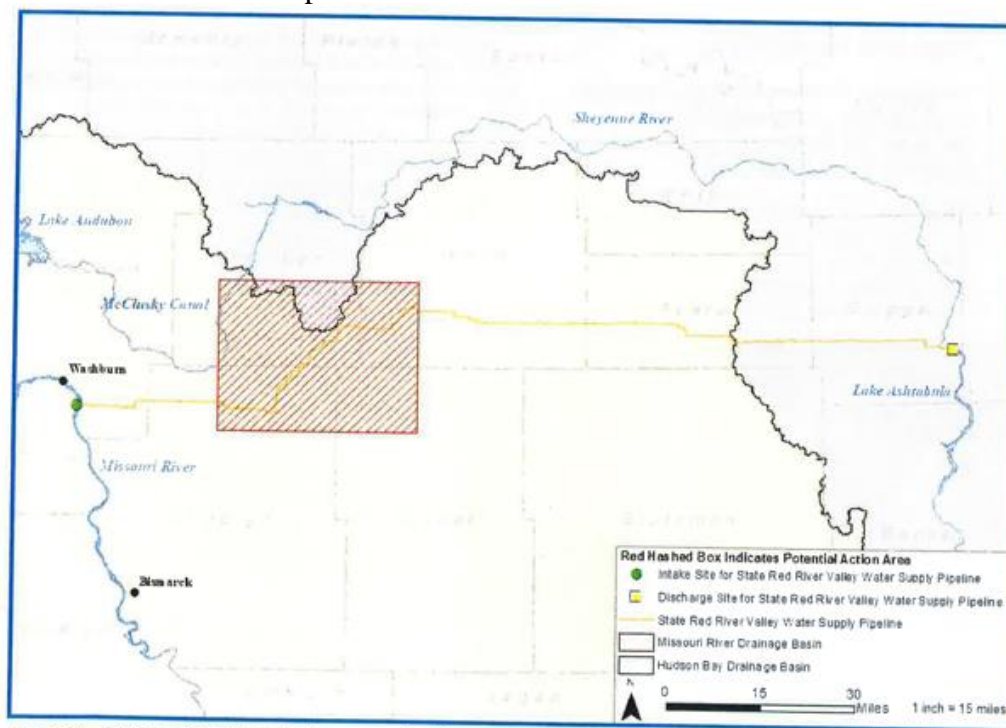


Figure 2. Scope of Reclamation's proposed action area

Figure 14: Proposed ENDAWS Route

Northwest Area Water Supply (NAWS)

An August 2015 Record of Decision (ROD) addressed invasive species and inter-basin water transfer concerns. The ROD identified the use of Missouri River water with subsequent advanced water treatment before it crosses the basin divide. This water treatment will provide flexibility in addressing long-term Safe Drinking Water Act standards to provide a safe and reliable drinking water supply to this region, while providing additional benefits for biota treatment (Figure 15).

Current Design/Construction

Biota Water Treatment Plant Design

A value engineering workshop was held the week of June 24, 2019. The Value Engineering report was received August 20, 2019. An accountability report responding to the input received from the value engineering report was submitted to Reclamation. The 60 percent design review meeting was held November 5, 2019. The 90 percent design review meeting was held March 4, 2020. Final plans and specifications are currently undergoing internal review. Bidding for the general contract for plant construction and equipment installation is scheduled for in late summer of 2020. Estimated total cost for Phase I is roughly \$64 million.

Equipment procurement contracts will be issued for the ultraviolet (UV) disinfection equipment and the dissolved air flotation (DAF) equipment for this facility. The UV equipment procurement contract has been awarded to Xylem for low-pressure high intensity UV units in the amount of \$707,125. The DAF equipment procurement bids were opened November 13, 2019 and awarded to Xylem Water Solutions, who submitted a bid of \$1,843,870 for its Leopold Clari-DAF system. Contract documents have been executed and the notice to proceed has been issued for the design phase of both procurement contracts. Other ongoing contracts for the project include:

NAWS Contract 2-4B – Westhope Corner to Souris Corner

This contract includes about 15.25 miles of pipe and related appurtenances to extend the potable distribution system from Highway #5 from the Westhope corner to the Souris Corner. This contract includes a 5,230-foot-long bore under the Souris River and the J. Clark Salyer Wildlife Refuge. Bids were opened March 5, 2020. The contract was awarded to Wagner Construction, Inc. on April 27, 2020. Contract documents were signed on May 18, 2020. A pre-construction conference was scheduled for May 26, 2020. Total estimated project cost is \$6.6 million.

NAWS Contract 7-1B – Minot WTP Phase II Improvements

The contract, awarded by the State Water Commission at its February 8, 2018 meeting to PKG Contracting, consists of construction of a new primary treatment building at the Minot water treatment facility to replace the aging softening basins, chemical storage and feed systems, a new laboratory, break room, and IT facilities. Work on this project is currently underway. The substantial completion date for this contract was December 20, 2019. The contractor, however, is behind schedule by 5 to 7 months. Estimated project cost is \$28 million.

NAWS Contract 2-4A - Renville Corner to Westhope

This contract will involve roughly 17.5 miles of pipe and related appurtenances to extend the potable distribution system from the corner of US Highway 83 and State Highway 5 to 6 miles

south of Westhope.

The contract is substantially complete as of January 6, 2020. The final completion date is June 1, 2020 for final reclamation. One change order has been executed, adding two days to the contract. Total estimated project cost is \$5 million.

NAWS Contract 2-3C - Lansford to Renville Corner

This contract will involve roughly 18 miles of pipe and related appurtenances to extend the potable distribution system north of Minot, near Lansford, to tie into the existing pipeline along Highway #5. This contract will complete the 'looped' nature of the distribution pipeline, greatly expanding the hydraulic capacity and flexibility to serve customers as well as adding redundancy to the system. Bids were opened June 18, 2019. Following execution of the contract, the Notice to Proceed was presented on October 2, 2019. Materials have been purchased and the boring subcontractor began installing wetland, railroad, and road crossings in March 2020. Fourteen of the 16 borings are completed. Pipeline installation began the week of May 11, 2020. Final completion date is October 1, 2020. Total estimated cost is \$5.4 million.

NAWS Contract 6-1A - Intake Modifications to Snake Creek Pumping Plant

The procurement contract for the variable frequency drive (VFD) equipment will be beneficial due to the incoming voltage and power rating of the motors. The procurement documents are nearly complete and were planned to be submitted for final review in November 2020. This facility will have to come online coincident with the completion and commissioning of the Biota Water Treatment Plant.

A draft facility use agreement with Reclamation is currently being reviewed. Meetings have been held with Reclamation and the Corps of Engineers to discuss permit requirements for the intake pipeline and screen, work within the Snake Creek building, and the discharge pipeline through U.S. Highway #83 embankment. The 60 percent design review meeting was held March 18, 2020. The 90 percent design documents are currently under internal review. Total estimated cost is about \$25 million.

NAWS Contract SA No. 80

This contract generally consists of pumping out and cleaning of the vaults, exercising the valves, pressure testing and making necessary repairs to the NAWS raw water line south of Minot to Lake Sakakawea. After a September 25, 2019 bid opening, the contract was awarded to Wagner Construction. The preconstruction conference was held November 6, 2019 in Minot and the Notice to Proceed was issued at that time. The first segment of pipeline has been successfully pressure tested. The second and third segment of pipeline had slow pressure leaks and the fourth segment has a tangential pipe that needs to be replaced. The completion date for this project is July 31, 2020. Total estimated cost is less than \$0.5 million.

NAWS Contract 2-4C – Souris Corner to Bottineau

About 14 miles of pipe, and related appurtenances, will be installed to extend the potable distribution system to the end of the project. A 60 percent design review was held on February 18, 2020. Final plans and specifications are planned to be available by June 2020. Total estimated

cost is \$6.5 million.

NAWS Contract 4-3A/5-3A – Lansford Reservoir and Pump Station

A 4.3-million-gallon reservoir and 2500 gallon per minute pump station will be constructed on the potable distribution system north of the Minot Air Force Base. This will be the only storage on the distribution system north of Minot and will allow additional user turnouts to be activated once more water is available from the City of Minot. A 90 percent design review was held on March 19, 2020. Total estimated cost is \$16 million.

NAWS Contract 5-1A – South Prairie Reservoir and Hydraulic Control Structure

The contract includes construction of a ten-million-gallon reservoir (located about 3 miles north of Highway #23 on the NAWS raw water line) and a hydraulic control structure (located 2 ½ miles south of HW #23 at the high point of the raw water pipeline). A 30 percent design review was held in January 2020. Total estimated cost is \$18 million.

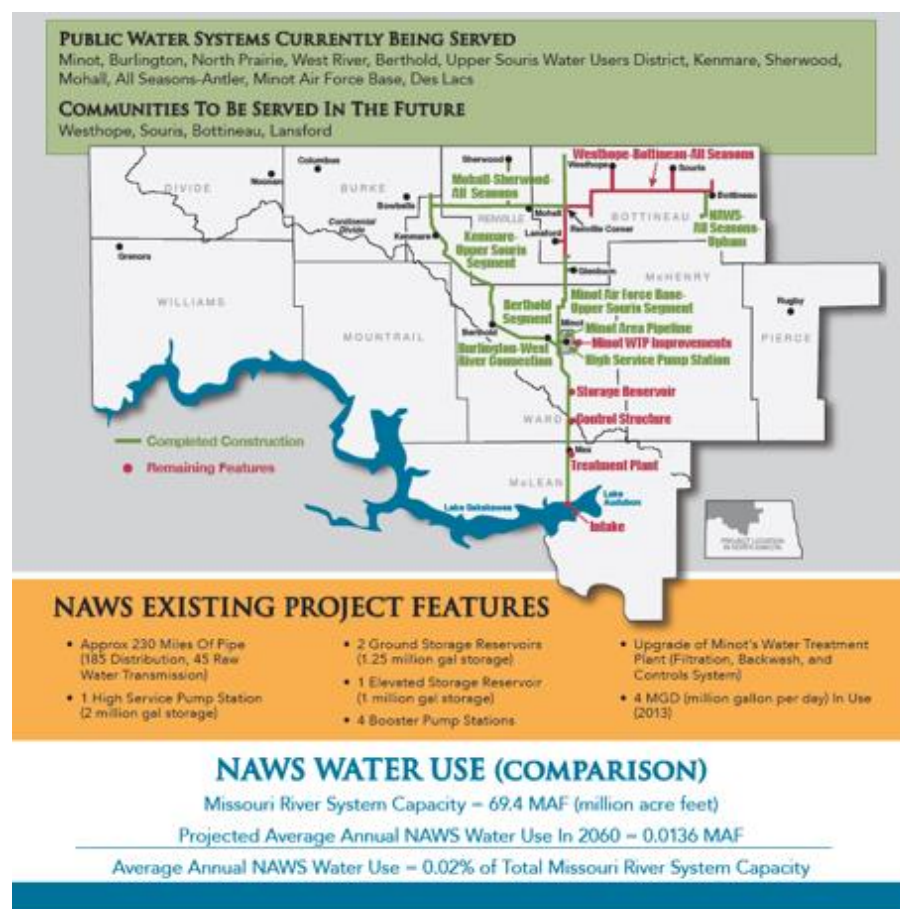


Figure 15: NAWS Project

Red River Retention Authority

The Red River Retention Authority (RRRA), formed in 2010, is comprised of members of the Red River Joint Water Resource District, a North Dakota political subdivision, and the Red River Watershed Management Board, a Minnesota political subdivision. The primary objective of the Red River Retention Authority is to ensure joint, comprehensive, and strategic coordination of retention projects in the Red River of the North watershed and facilitating implementation and construction of temporary retention in the Red River Watershed for the purpose of flood damage reduction. Several entities are involved as partners in this process.

The main goal of the RRRA is to reduce the severe flood damage within the Red River watershed. While the majority of the benefit from an individual project will be in the sub-watershed where it is located, a combination of several detention projects would also be expected to reduce peak flows on the Red River mainstem.

Regional Conservation Partnership Program (RCPP):

The Secretary of Agriculture announced on January 14, 2015 that up to \$12 million was included in the 2014 farm bill for the Red River Basin of the North Flood Prevention Plan through the NRCS-Regional Conservation Partnership Program (RCPP). The Red River Retention Authority is the lead partner for the projects (Figure 16). These funds will be used to plan PL-566 like projects to achieve the main goal of reducing flood damages. They will be leveraged with state and local funds.

A local cooperation agreement was signed, for each of the studies, between the Natural Resource Conservation Service (NRCS) and the local sponsors. Public meetings were held with problems within the watersheds being identified. After development of a “purpose and need” statement, the task teams identified potentially feasible projects that would address these needs. Further analysis will be required for each potential project to determine if they have a benefit cost (B/C) ratio of at least 1 to be eligible for federal cost share for construction.

There were originally 20 watershed studies that were approved for cost share. Planning has ceased, or has been requested to cease, for 6 of the watershed studies.

An extension has been approved for the majority of the active Minnesota RCPP watershed studies, moving the completion date to September 30, 2021. The contract for the 6 active North Dakota watershed studies expired on September 30, 2019. The local sponsors continue to work on getting these plans completed with other funding sources. Planning has been completed on the North Branch Park River watershed study and the Rush River watershed study.

A portion of the federal funds are still available for design of approved projects from a completed watershed study. It appears that these funds will be used to start the final design for a project in the Rush River watershed and the North Branch Park River watershed.

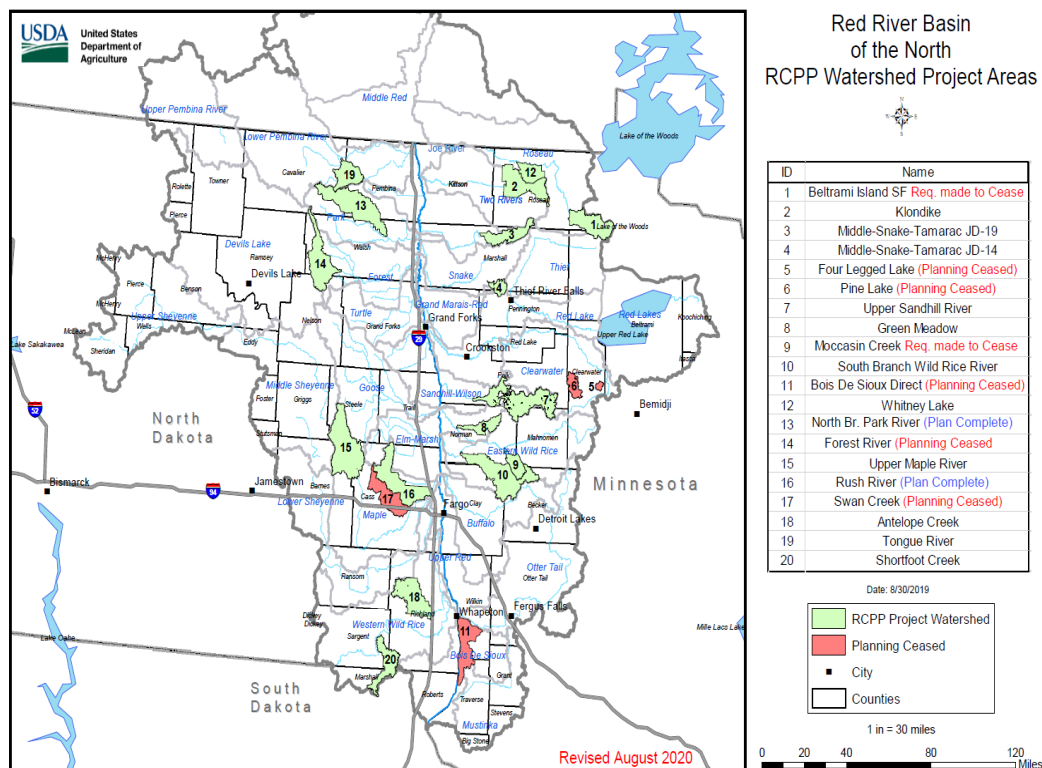


Figure 16: Red River Conservation Partnership Program – Red River Basin

9.02 Devils Lake Sub-Basin

The water elevation of Devils Lake was 1448.2 msl on January 1, 2019 (Figure 17). Due to a slow snow melt, and minimal spring precipitation, the lake level increase was limited. The 2019 peak was about 1449.2 msl, one foot higher than the elevation at the start of 2019. With near average summer precipitation, the water elevation dropped to 1448.2 msl by early September 2019. Heavy precipitation in September and October 2019 caused the lake level to continue rising through the end of 2019, reaching an elevation of 1448.9 msl on January 1, 2020.

A snow pack, with a high water content, developed early in the southern portion of the watershed during the 2019-20 winter. With limited precipitation after the 3rd week in January 2020, and a mild snow melt, the rise in the lake level was limited. The apparent 2020 peak water elevation is about 1449.9 msl occurring around July 12. This is about 1.0 feet higher than the water elevation that existed at the beginning of 2020, and about 0.7 feet higher than the 2019 peak.

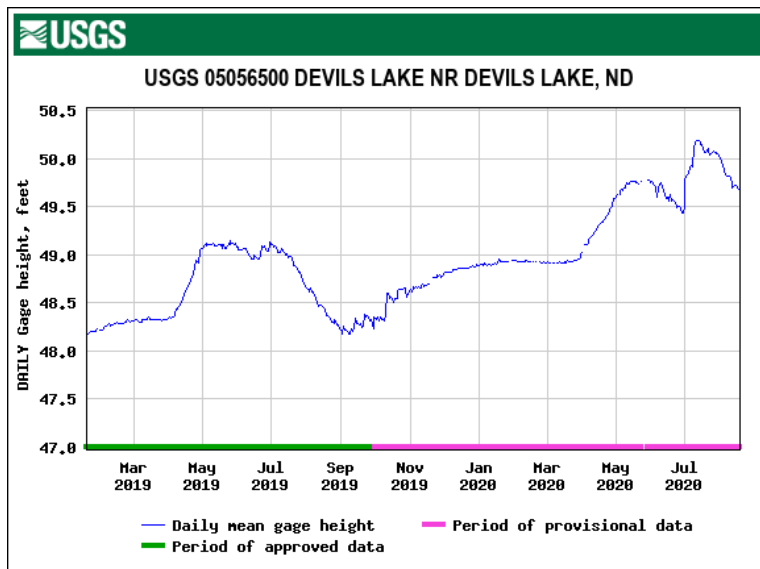
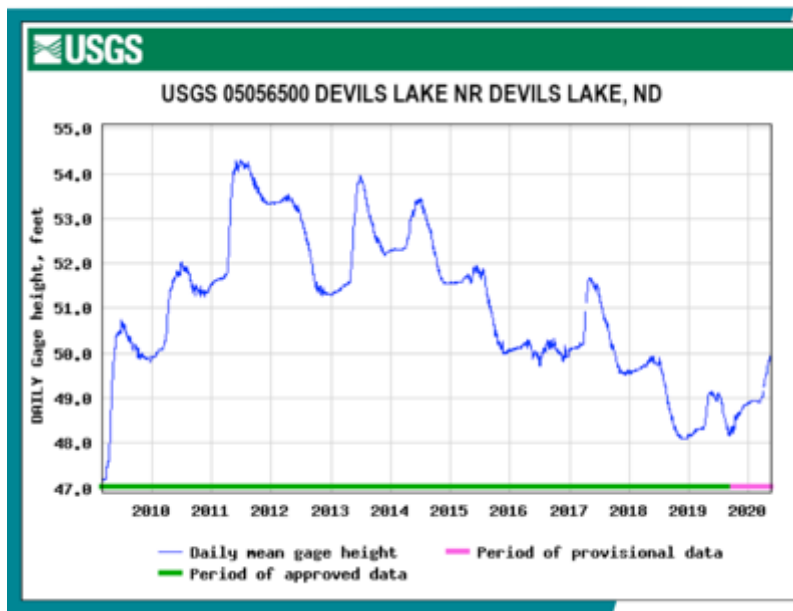


Figure 17: Devils Lake Elevation 2019-2020.

Devils Lake elevation for the period 2009-2020 are shown in Figure 18. The period of record lake elevations are shown in Figure 19. The estimated Devils Lake inflows are shown in Figure 20.

LAKE ELEVATION 2009 - 2020



Devils Lake Peaked At
1454.3 Feet In 2011

The Lake Approached
But Did Not Reach
1448 Feet In 2018 &
2019

Figure 18: Devils Lake Elevation for the Period 2009-2020

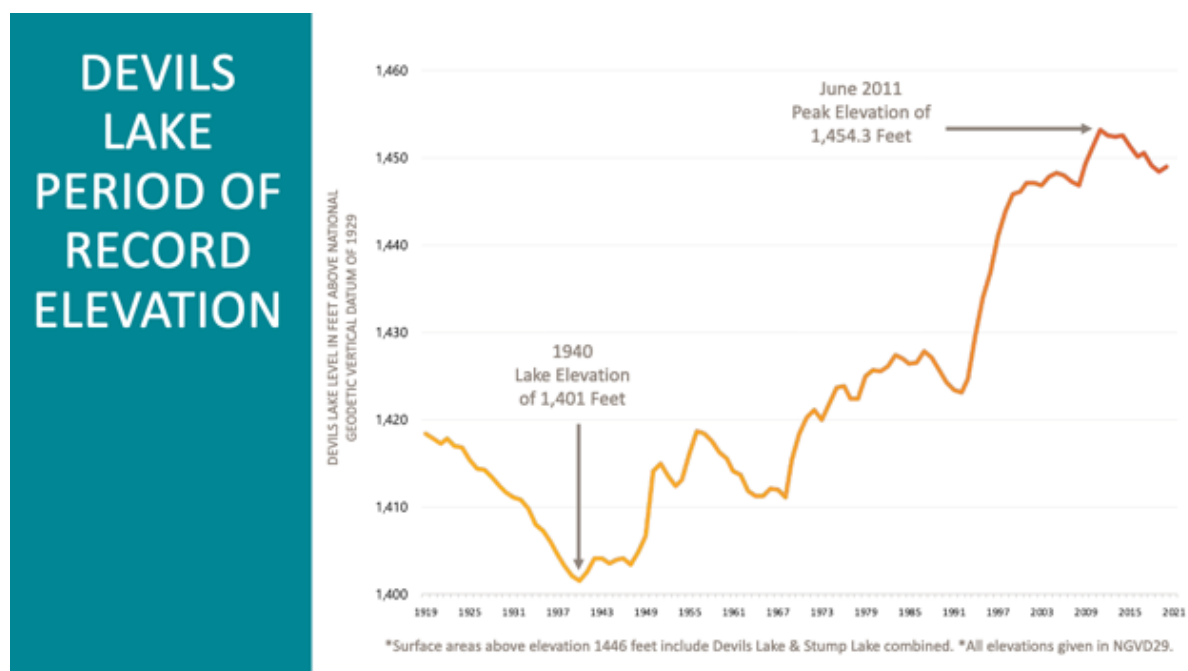


Figure 19: The Period of Record Lake Elevations

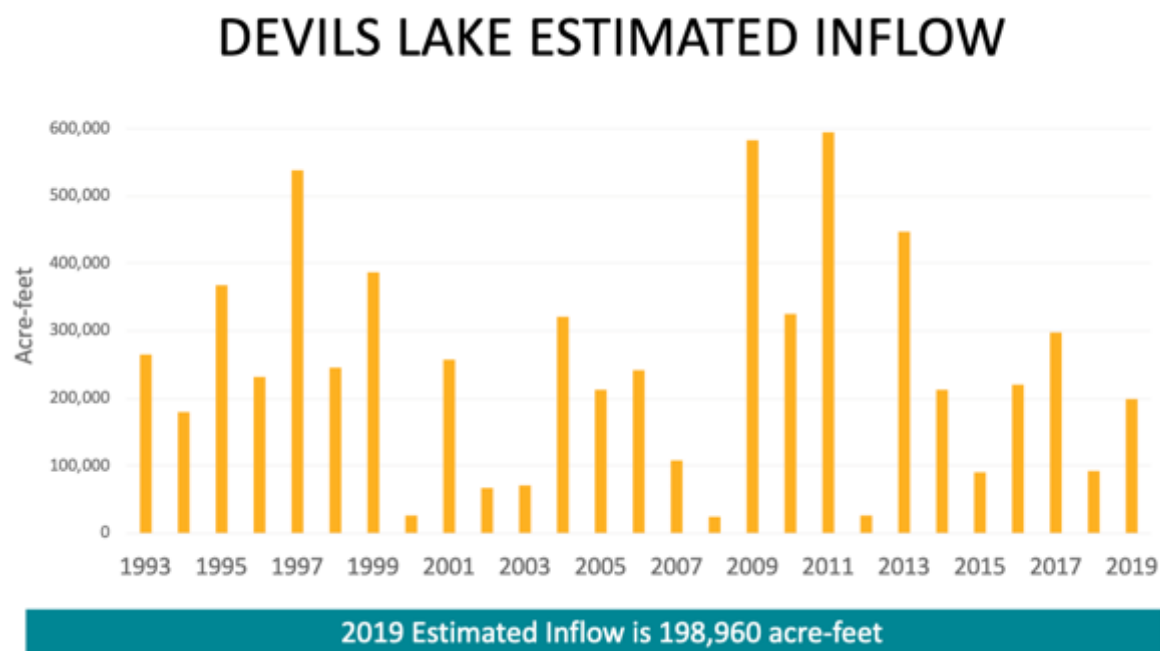


Figure 20: Devils Lake Estimated Inflows

State Emergency Outlets Project Update:

2020 Operation:

The start of the discharge from the outlets was delayed due to high flows on the Sheyenne River and Red River.

The west outlet started at full capacity, 250 cfs, on June 1. The east outlet started at a discharge of 80 cfs on June 2. The discharge rate was slowly increased to about 230 cfs by June 19. The rate of discharge from the outlets will be controlled to prevent exceedances of the water quantity and water quality restrictions on the Sheyenne River. Both outlets were shutdown late on June 30, due to heavy precipitation that increased flows in the river system. The west outlet was restarted on July 22 while the east outlet was restarted on July 25. The west outlet was currently operating at 250 cfs, while the east outlet continued operating at 160 cfs.

Table 15 below summarizes the extent of discharge from the outlets for the 2020 calendar year:

| Month | Days Discharged | | Average Discharge (cfs) | | Monthly Volume (acre-feet) | |
|--------------|-----------------|------|-------------------------|------|----------------------------|-------|
| | West | East | West | East | West | East |
| May | 0 | 0 | 0 | 0 | 0 | 0 |
| June | 30 | 29 | 247 | 162 | 14,687 | 9,655 |
| July | 10 | 7 | 58 | 20 | 3,568 | 1,202 |
| August | 31 | 29 | 248 | 126 | 15,262 | 7,778 |
| Sept. | | | | | | |
| Oct. | | | | | | |
| Nov. 2020 | | | | | | |
| TOTAL | | | | | | |

The January 2019 through March 2020 sulfate monitoring results are shown in the following chart (Figure 21).

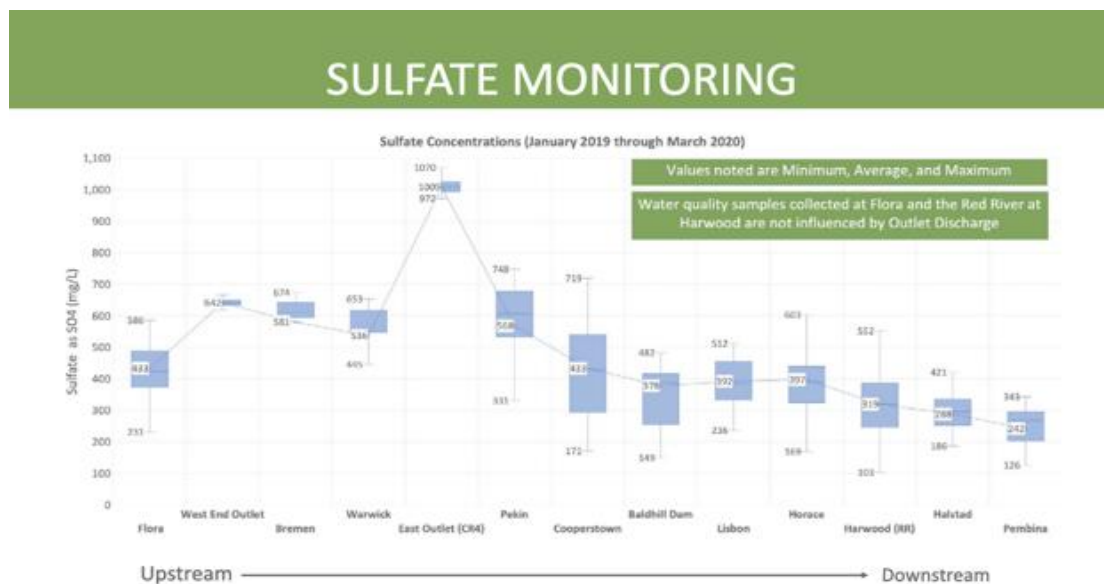


Figure 21: Sulphate Monitoring

Additional water quality information is available on the ND State Water Commission website and on the U.S. Geological Services website.

Devils Lake Outlet Management Advisory Committee:

The Devils Lake Outlets Management Advisory Committee met, by webinar, on May 20, 2020. A presentation was provided to summarize the current situation in the basin, previous outlet operations and water quality monitoring, and an outlook for 2020 operations.

Committee members discussed past outlet operation and their recommendations for outlet operation in 2020. Overall, the Committee recommendation was similar to recent years. The Committee recommends that both outlets be operated within the downstream limitations on water quality and quantity and to reconvene to discuss future outlet operating parameters when the lake level reaches 1448.0 msl. A minority recommendation was made of 6 of 17 Committee Members to remove specific reference to any target lake elevation and to recommend operation whenever possible within the water quality and quantity guidelines.

9.03 U.S. Army Corps of Engineers Flood Control Activities

Introduction

The U.S. Army Corps of Engineers (Corps, USACE) St. Paul District has a long history of involvement in water resource issues in the Red River of the North Basin. The St. Paul District operates reservoirs for flood control, recreation, and environmental purposes.

The Corps works with other federal and state agencies, municipalities, local watershed districts, environmental groups, and local communities to address water resource problems and opportunities in the basin. The Corps also regulates work in navigable waters and other waters of the United States. The Omaha District is responsible for part of the Red River of the North Basin in North Dakota. The St. Paul District is responsible for other areas of the basin in North Dakota and Minnesota.

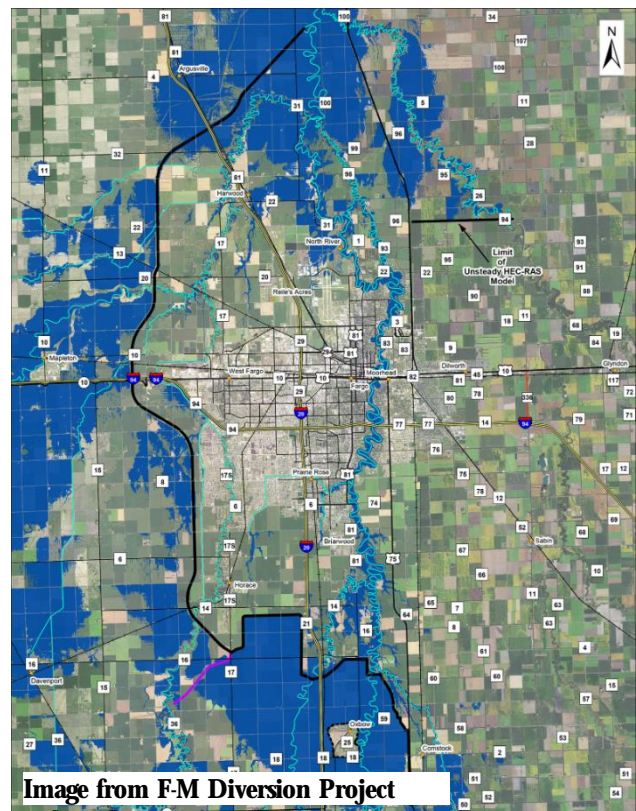
Currently, Corps activities in the basin include conducting flood risk management and ecosystem restoration studies, constructing flood risk management and ecosystem restoration projects, and providing emergency assistance and disaster response.

Current Construction Projects

Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Fargo, North Dakota; Moorhead, Minnesota
The project was authorized in the Water Resources Reform and Development Act of 2014 and funded to begin construction in 2016. It includes building a 20,000 cubic feet per second diversion to the west of Fargo with upstream staging and storage. Once construction is complete, the diversion would operate for events larger than a 20-year flood event. The project will provide permanent flood protection to a metropolitan area of 230,000 people.

The project is being implemented using a split delivery plan. Under this plan, the local sponsor constructs the diversion channel using a public-private partnership, and the Corps constructs the Southern Embankment or “dam” portion of the project. Federal construction began in spring 2017 with the diversion inlet structure. The sponsors issued a request for proposals in December 2016 for their portion of the project, and discussions were initiated with the three shortlisted teams.



Construction of the diversion inlet structure and negotiations for the diversion channel were suspended after a federal judge issued a temporary injunction on the project in September 2017. A revised plan, called “Plan B,” was developed as a result of a Governors’ Task Force and the Minnesota Department of Resources issued a dam safety and public waters permit in December 2018. A supplemental environmental assessment was completed for Plan B by the Corps in February 2019. In April 2019, the federal judge issued an order modifying the injunction to allow for certain construction in North Dakota. Construction resumed on the Diversion Inlet Structure in April 2019 and began for the Wild Rice River Structure in May 2020. The sponsors resumed the public-private partnership (P3) procurement for the diversion channel in February 2020.

Drayton Dam Fish Passage Mitigation Project

Drayton, North Dakota

This aquatic ecosystem restoration project will provide fish passage and eliminate dangerous hydraulic conditions at Drayton Dam while maintaining the pool for water supply and bank stability. Construction plans involve replacing the existing dam and creating rock riffles. The project is being included as mitigation for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project. Construction will be concurrent with the Red River Control Structure, which is expected to begin in 2022.

Devils Lake Embankment Project

Devils Lake, North Dakota

Devils Lake is a terminal lake in Devils Lake Basin, meaning water leaves Devils Lake through evapotranspiration or when its elevation is high enough to overflow the basin’s boundary. Because Devils Lake typically does not have a natural outlet, it is subject to extreme variations in lake levels depending on changes in climate.



As of June 15, 2020, the lake is at elevation 1449.4 feet, down from its record elevation of 1454.30 feet in June 2011. The embankment construction is complete to a minimum elevation of 1466.00. The project was transitioned to the city of Devils Lake, North Dakota on July 17, 2018. All that remains to be completed is excavation of a ponding area and final project documentation.

North Dakota Environmental Infrastructure Program (Section 594)

The Corps is authorized to assist communities and rural areas in North Dakota under this program. The Corps provides design and construction assistance for wastewater treatment and related facilities; combined sewer overflow; water supply, storage, treatment, and related facilities; environmental restoration; and surface water resource protection and development.

Section 594 of the Water Resources Development Act of 1999, Public Law 106–53, as amended, authorizes the following sanitary sewer systems where the work is performed by the non-federal sponsor.

City of Petersburg Sanitary Sewer Service Replacement Project

The 1950s era sewer has significant deterioration, and the city could not afford the rehabilitation alone. Removing the current sanitary sewer could cause potential flooding. The city requested assistance from the Corps, which selected the city as the non-federal sponsor. New pipes, a lift station, and a drain tile system will be installed. In fiscal year 2017, the Section 594 program received \$2,765,000 for this project. Construction of this project is ongoing.



City of Kindred Sanitary Sewer Service Improvement Project

During periods of wet conditions, heavy precipitation, and snowmelt events, the city's wastewater collection system experiences substantial increases in wastewater flows, and at times exceeds the capacity of the city's main wastewater pump station, resulting in pumping of untreated wastewater out of the system and onto the ground. The city of Kindred (the non-federal sponsor) requested assistance from the Corps; this Section 594 project includes the design and rehabilitation of the existing stabilization ponds, the expansion of two new cells, the rehabilitation of the main lift station, and the replacement of the force mains to the stabilization ponds. In fiscal year 2019, the Section 594 program received \$2,950,000 for this project. The project partnership agreement was signed in June 2019. In fiscal year 2020, the Section 594 program received an additional \$1,250,000 for Phase 2 of the Kindred project. The Corps continues to work closely with the city as they finalize their plans.

Current Studies

Red River Basin-Wide Feasibility Study

The study began in June 2008. The North Dakota Joint Water Resource District and the Minnesota Red River Watershed Management Board are the local sponsors. Products of the study include planning, data collection, hydrologic and hydraulic modeling, and development of a comprehensive watershed management plan (CWMP). The Corps, the Red River Basin Commission (RRBC), and local stakeholders and experts, including representatives from both the U.S. and Canada, cooperatively developed the CWMP.

Building on the RRBC's 2005 Natural Resources Framework Plan, the CWMP contains recommendations for action in flood risk management and hydrology, aquatic and riparian ecosystem restoration, water quality, water supply and drought management, recreation, and soil health. The Corps, the RRBC, and federal, state, and local stakeholders can implement these actions.

The RRBC provided a letter of support in June 2017 for the federally-implementable actions, which include de-authorization of two existing Corps channel projects. All elements of the basin-wide study will be completed in 2019, following a final meeting with the Red River Basin technical advisory committee to discuss the hydraulic models developed by the Corps.

CAP 1135 – Lower Otter Tail River Restoration Project

Breckenridge, Minnesota

Under Section 1135 of the Water Resources Development Act of 1986, the Corps is authorized to study and implement ecosystem restoration projects at existing Corps projects. The Corps constructed a flood control project in the 1950s that straightened and enlarged a portion of the Lower Otter Tail River between Orwell Dam and the city of Breckenridge, Minnesota. This reach of the Lower Otter Tail River is characterized by unstable banks, excessive sediment loading, and degraded in-stream and riparian habitats.



The St. Paul District and the Buffalo-Red River Watershed District (BRRWD) are currently completing a feasibility study on improving the environmental conditions of the Lower Otter Tail River while maintaining the originally authorized purpose of protecting adjacent lands from flood damages. Potential alternatives include constructing rock riffle structures to create diversified river pools and reconnecting river meanders that were cut off.

The Corps and the BRRWD plan to complete the feasibility study in 2020, which will identify a plan for achieving the project goals. Construction would likely begin no earlier than 2021, subject to availability of federal and local funds. The maximum federal contribution is limited to \$10M.

CAP 14 – Sheldon Road Bridge

Sheldon, North Dakota

The purpose of this project is to evaluate alternatives and formulate a plan to stabilize the riverbank adjacent to Sheldon Road in order to protect the bridge from eroding into the Sheyenne River. The project is located where Sheldon Road crosses over the Sheyenne River approximately 4.75 miles south of Sheldon, North Dakota.

The bank of the Sheyenne River adjacent to the west side of the south abutment of the Sheldon Road Bridge, located on County Road 54, is being threatened by severe erosion. Surveys estimate that approximately 30 linear feet has eroded since 2006 with additional erosion happening since. The erosion is threatening the use of Sheldon Road Bridge, and without proper intervention, erosion could continue and potentially affect the integrity of both the bridge and the County Road 54 roadway.

Ransom County submitted a request for assistance on February 12, 2018. The Corps is currently working closely with Ransom County, the non-federal sponsor, on the federal interest determination; approval is anticipated in June 2020. Upon the determination of federal interest, the feasibility phase of the project will begin. Final report approval and execution of a project partnership agreement between the Corps and Ransom County are expected in early 2021.

The first \$100,000 of project funding is 100 percent federal and has been provided to initiate the feasibility study. The design and implementation phase of the project will be cost shared at 65 percent federal and 35 percent non-federal.

Planning Assistance to States and Tribes (Section 22)

Long Term Flood Plan

North Dakota and Minnesota

The Corps is currently working on a Planning Assistance to States and Tribes Project for the RRBC. The project consists of developing a basin-wide, long term flood plan for the Red River watershed within Minnesota and North Dakota. Specifically, the Corps is developing an updated hydrologic model for the basin to assess 0.5 to 0.2 percent chance exceedance events and the possibility of flood risk reduction through possible upland storage impoundments for rarer flood events. The Corps will update existing hydraulic models and the sponsor will provide basin-wide hydrology models of the tributaries to be used in the storage analysis. The Corps will also incorporate climate variability to evaluate potential impacts on future flood magnitudes.

Upper Red River Watershed Wetland Restoration Prioritization Study

Minnesota

The study began in June 2008. The North Dakota Joint Water Resource District and the Minnesota Red River Watershed Management Board are the local sponsors. Products of the study include planning, data collection, hydrologic and hydraulic modeling, and development of a comprehensive watershed management plan (CWMP). The Corps, RRBC, and local stakeholders and experts, including representatives from both the U.S. and Canada, cooperatively developed the CWMP.

Building on the RRBC's 2005 Natural Resources Framework Plan, the CWMP contains recommendations for action in flood risk management and hydrology, aquatic and riparian ecosystem restoration, water quality, water supply and drought management, recreation, and soil health. The Corps, the RRBC, and federal, state, and local stakeholders can implement these actions.

The RRBC provided a letter of support in June 2017 for the federally implementable actions, which include de-authorization of two existing Corps channel projects. All elements of the basin-wide study were completed in 2019, following a final meeting with the Red River Basin technical advisory committee to discuss the hydraulic models developed by the Corps.

Ongoing Programs

Silver Jackets

The Corps has worked with the U.S. National Weather Service, the U.S. Geological Survey, and others on the placement of soil moisture and temperature instrument packages around the basin to provide detailed hydrologic parameters to improve spring flood forecasts. There was a project to update river gage datum to the current standard (NAVD 1988) and provide consistent elevations for the river stages across the basin that converted 34 river gages in 2017. There is strong interest to continue the conversion process for other gages, and funding will be sought for fiscal year 2021 under the Flood Plain Management Services (FPMS) program.



Emergency Operations

During flood events in the Red River Basin, the St. Paul District provides emergency assistance in support of the locally led flood response. The St. Paul District becomes part of a large force made up of local, state, and federal responders as well as volunteers.

In 2020 the Flood Area Manager and Assistant Area Manager for the Red River of the North met with communities along the Red and Sheyenne rivers. At the meetings they discussed the community flood response and emergency action plans. Areas where support from the St. Paul District may have been needed were identified and potential actions noted so we could be prepared.

The 2020 melt was ideal, with moderately warm days and below freezing nights. This weather extended the melt's duration, reducing its damaging effects. Spring rains following the melt fell at regular intervals, extending the high stages further and causing some damage. Many flood risk management features required maintenance following the 2019 event.

9.04 USGS Water Resource Investigations and Activities

Streamflows for the Red River and its tributaries were at much above normal levels (>90 percentile) for the 2019/2020 winter, with some locations having record high winter streamflows. Winter was characterized by soil moisture levels that were much above normal, shallower frost depths, and snow water equivalent amounts that were near to above normal by March per the National Weather Service (NWS) Office in Grand Forks, ND. "Total precipitation (rain and snow-water) measured across the basin from September 1 through March 10 was 4-8 inches above the long-term normal for most of Red River Basin," NWS March 12, 2020, Spring Flood Outlook. Snowmelt runoff began in late March, progressing from south to north.

Peaks in the upper Red River (south of Fargo, ND) occurred the first and second weeks of April as an initial snowmelt runoff peak was followed by a secondary peak caused by additional precipitation and melting. The peak progressed downstream, with the crest passing into Canada on April 18-19, 2020. Current (late May) Red River Basin river conditions vary; most locations are ranging from normal to above normal (25-90 percentile).

The Red River at Fargo crested on April 1 with a provisional peak gage height of 28.23 ft. and streamflow of 11,800 cfs, providing the 17th highest peak for the 119 years of peak flow record. The annual exceedance probability (AEP) was 0.10 or a "10-year recurrence interval". The Red River at Grand Forks crested on April 10 with a provisional peak of 47.70 ft. and streamflow of 73,800 cfs, providing the 7th highest peak for the 139 years of peak flow record.

The annual exceedance probability (AEP) was between 0.04-0.02 or a "25 to 50-year recurrence interval". A wet fall and spring snowmelt runoff combined to raise Devils Lake approximately 1.7 ft. with the current stage (late May) around 49.91 ft. Pumping from Devils Lake outlets has not yet begun for the year.

APPENDIX A

DIRECTIVES TO THE INTERNATIONAL RED RIVER BOARD

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DIRECTIVE TO THE INTERNATIONAL RED RIVER (Currently Under Review)

1. Pursuant to the Boundary Waters Treaty of 1909, responsibilities have been conferred on the Commission under a 1948 Reference from the governments of Canada and the United States with respect to the use and apportionment of the waters along, across, or in the vicinity of the international boundary from the eastern boundary of the Milk River drainage basin on the west up to and including the drainage basin of the Red River on the east, and under the May 1969 authorization from the governments to establish continuous supervision over the quality of the waters crossing the boundary in the Red River and to recommend amendments or additions to the objectives when considered warranted by the International Joint Commission.
2. This directive replaces previous directives and instructions provided by the International Joint Commission to the International Souris-Red Rivers Engineering Board, and in the February 8, 1995 Directive to the International Red River Pollution Board. This Directive consolidates the functions of those two former boards into one board, to be known as the International Red River Board (Board).
3. The Board's mandate is to assist the Commission in preventing and resolving transboundary disputes regarding the waters and aquatic ecosystem of the Red River and its tributaries and aquifers. This will be accomplished through the application of best available science and knowledge of the aquatic ecosystem of the basin and an awareness of the needs, expectations and capabilities of residents of the Red River basin.
4. The geographical scope of the Board's mandate shall be the Red River basin, excluding the Assiniboine and Souris Rivers. The Board's activities shall focus on those factors which affect the Red River's water quality, water quantity, levels and aquatic ecological integrity.
5. The Board's duties shall be to:
 - A. Maintain an awareness of basin-wide development activities and conditions that may affect water levels and flows, water quality and the ecosystem health of the Red River and its transboundary tributaries and inform the Commission about transboundary issues.
 - B. Provide a continuing forum for the identification, discussion and resolution of existing and water-related issues relevant to the Red River basin.
 - C. Recommend appropriate strategies to the Commission concerning water quality, quantity and aquatic ecosystem health objectives in the basin.
 - D. Maintain continuing surveillance and perform inspections, evaluations and assessments, as necessary, to determine compliance with objectives agreed to by governments for water quality, levels and quantity in the Red River basin.
 - E. Encourage the appropriate regulatory and enforcement agencies to take steps to ensure that agreed objectives are met.

- F. Encourage the appropriate authorities, such as resource and emergency planning agencies, to establish and maintain contingency plans, including early warning procedures, for appropriate reporting and action on accidental discharges or spills, floods and droughts.
- G. Monitor and report on flood preparedness and mitigation activities in the Red River basin and their potential effects on the transboundary aquatic ecosystems and encourage and facilitate the development and maintenance of flood-related data information systems and flood forecasting and hydrodynamic models. In carrying out this responsibility, the Board shall:
- i. Monitor progress by the governments (federal, state, provincial, municipal) in implementing the recommendations of the Commission's report on the Red River basin flooding, and in maintaining and advancing the work of the Task Force's legacy projects, and to this end provide opportunities for the public to comment on the adequacy of such progress.
 - ii. Encourage governments to develop and promote a culture of flood preparedness in the Red River valley.
 - iii. Encourage government efforts to develop and implement a long-term strategy for flood mitigation emergency preparedness.
 - iv. Encourage the sharing of accurate and timely transboundary information to support the development of improved flood forecasting techniques and procedures for early flood warnings and to improve communication of flood forecasts.
 - v. Provide through the activities of the Board a forum for the exchange of best practices and for other flood-related information on preparedness, mitigation, response and recovery to assist in transboundary problem solving.
 - vi. Promote the application of innovative technologies for supporting flood modeling and mapping.
 - vii. Monitor the adequacy of data and information collection networks (meteorological, hydrometric, water quality) for flood preparedness, forecasting and mitigation, within the larger context of overall water management needs in the basin.
 - viii. Monitor potential transboundary effects of flood mitigation and other works in the basin, and encourage cooperative studies necessary to examine these effects.

- ix. Encourage governments to integrate floodplain management activities in watershed and basin management.
 - x. Interact with all levels of government to help decision-makers become aware of transboundary flood-related and associated water management issues.
 - xi. Assist in facilitating a consultative process for resolution of the lower Pembina River Flooding issue.
- H. Involve the public in the work of the Board, facilitate provision of timely and ‘pertinent information within the basin in the most appropriate manner’, including electronic information networks; and conduct an annual public meeting in the Red River basin.
- I. Provide an annual report to the Commission, plus other reports as the Commission may request or the Board may feel appropriate in keeping with this Directive.
- J. Maintain an awareness of the activities of other agencies and institutions, in the Red River basin.
6. The Board shall continue to report on the non-Red River geographic areas under the responsibility of the former International Souris-Red Rivers Engineering Board, including the Popular and Big Muddy basins, but excluding the Souris River basin until the Commission determines otherwise.
 7. The Board shall have an equal number of members from each country. The Commission shall normally appoint each member for a three-year term. Members may serve for more than one term. Members shall act in their personal and professional capacity, and not as representatives of their countries, agencies or institutions. The Commission shall appoint one member from each country to serve as co-chairs of the Board. An alternate member may not act as a co-chair.
 8. At the request of any members, the Commission may appoint an alternate member to act in the place of such member whenever the said member, for any reason, is not available to perform such duties as are required of the member.
 9. The co-chairs of the Board shall be responsible for maintaining proper liaison between the Board and the Commission, and among the Board members. Chairs shall ensure that all members of the Board are informed of all instructions, inquiries, and authorizations received from the Commission and also activities undertaken by or on behalf of the Board, progress made, and any developments affecting such progress.
 10. Each chair, after consulting the members of the Board, may appoint a secretary. Under the general supervision of the chair(s), the secretary (ies) shall carry out such duties as are assigned by the chairs or the Board as a whole.
 11. The Board may establish such committees and working groups as may be required to discharge its responsibilities effectively. The Commission shall be kept informed of the duties and

composition of any committee or working group. Unless other arrangements are made, members of the Board, committees or working groups will make their own arrangements for reimbursement of necessary expenditures.

12. The Commission should also be informed of the Board's plans and progress and of any developments or cost impediments, actual or anticipated, which are likely to affect carrying out the Board's responsibilities.
13. The Commission shall be informed, in advance, of plans for any public meetings or public involvement in the Board deliberations. The Board shall report in a timely manner, to the Commission on these meetings, including representations made to the board.
14. The Board shall provide the text of media releases and other public information materials to the Secretaries of the Commission for review by the Commission's Public Information Officers, prior to their release.
15. Reports, including annual reports and correspondence of the Board shall, normally, remain privileged and be available only to the Commission and to members of the Board and its committees until their release has been authorized by the Commission.
16. If, in the opinion of the Board or of any member, any instruction, directive, or authorization received from the Commission lacks clarity or precision, the matter shall be referred promptly to the Commission for appropriate action.
17. In the event of any unresolved disagreement among the members of the Board, the Board shall refer the matter forthwith to the Commission for decision.
18. The Commission may amend existing instructions or issue new instruction to the Board at any time.

APPENDIX B

B.1 WATER QUALITY OBJECTIVES

B.2 WATER QUALITY ALERT LEVELS

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B.1 WATER QUALITY OBJECTIVES

On October 1, 1964, the Governments of Canada and the United States submitted a reference to the IJC requesting an investigation of pollution in the waters crossing the International Boundary in the Red River pursuant to the provisions of Article IV of the Boundary Waters Treaty of 1909.

Following receipt of the reference, the Commission established the International Red River Water Pollution Board on December 2, 1964 and appointed technical experts to the Board from both countries. The Commission provided detailed instructions to the Board in the form of a directive which asked that all relevant water quality information be examined, pollution sources identified, and remedial measures determined. The International Red River Water Pollution Board conducted investigations from 1965 to 1966 and submitted a report to IJC in October 1967. The purpose of the water quality objectives and alert levels is to restore and maintain the chemical, physical, and biological integrity of the waters of the Red River. Five specific Binational water quality objectives were adopted for the Red River at the international boundary in 1969.

The IJC conducted public hearings on April 11, 1968 and reported to the Governments on their findings, recommendations and conclusions. The key recommendation was that WQOs, as defined in the IJC report, be accepted by Governments. In letters dated May 13 and 14, 1967, the Governments informed the Commission that the recommendations contained in the Commission's report to Governments were accepted and approved. The two Governments specifically authorized the Commission to establish continuous supervision over the quality of waters in the Red River crossing the International Boundary and to recommend amendments or additions to the objectives when warranted by the Commission. IJC recommended the establishment of WQOs for a limited number of variables at the boundary on April 11, 1968 and the recommendation was approved by governments on May 4, 1969. Shortly after, the Commission established the International Red River Pollution Board on June 10, 1969.

Water quality objectives are used when necessary to secure government commitment to pollution abatement action. Compliance with the objectives is the primary means by which the International Red River Board identifies major water quality issues to the IJC.

The term “exceedance” is used to describe a situation where an objective is not met. A situation is classified as an exceedance if an individual instantaneous sample, obtained from the continuous auto- monitor, or through a grab sample, is equal to or greater than the corresponding water quality objective (except for dissolved oxygen, which must be observed to be equal to or less than the objective). The five specific parameters and corresponding objective are listed below.

| | |
|------------------------|---------------------|
| E. Coli | 200 colonies/100 ml |
| Chloride | 100 mg/L |
| Sulphate | 250 mg/L |
| Total Dissolved Solids | 500 mg/L |
| Dissolved Oxygen | 5 mg/L |

B.2 WATER QUALITY ALERT LEVELS

Water quality alert levels are used to complement water quality objectives. If exceeded, alert levels will trigger investigative action on the part of the IRRB or its representatives. The exceedance is addressed in terms of its magnitude, implications to water uses and possible resolutions. On the basis of alert level exceedances and subsequent investigations, the IRRB may advance proposals for additional objectives.

Water quality alert levels, for a wide range of parameters, in addition to the five specific parameters noted above, were developed by a working group in 1985. These alert levels were approved by the predecessor International Red River Pollution Board in January 1986.

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APPENDIX C

WATER POLLUTION CONTROL CONTINGENCY

PLAN LIST OF CONTACTS

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Notification List
For D.O. Depletions, Non-toxic, Oil, and Toxic Spills

United States:

Minnesota Pollution Control Agency – Detroit Lakes, MN

Jim Ziegler - (218) 856-0730 (office) State Duty officer
(218) 846-0719 Fax
1-800-422-0798 (24-hr) State Duty officer

Minnesota Department of Natural Resources – Bemidji, MN (Fisheries)

Marilyn Danks - (651) 259-5087 (office – primary contact Central Office St. Paul)
Henry Drewes - (218) 308 -2633 (office – secondary contact Bemidji office)
1-800- 422-0798 (24-hr National Response Center)

North Dakota Department of Health – Bismarck, ND

David Glatt - (701) 328-5210 (office)
Aaron Lason - (701) 328 -5214 (office)
(701) 328-5200 fax
1-800-472-2121 (24-hr in-state-ask for REACT Officer)
(701) 328-9921 (24-hr out-of-state - ask for REACT Officer)

Environmental Protection Agency – Denver, CO

Ayn Schmit - (303) 312-6670 office
-(303) 312 -8637 (office-alternate contact)
-(303) 312-7206 fax
1-800-424- 8802 (24-hr National Response Center)

Canada:

Manitoba Agriculture and Resource Development – Winnipeg, MB

Spills - (204) 944-4888 (24-hr telephone service emergency number)

Exceedance - Nicole Armstrong – nicole.armstrong@gov.mb.ca

Environment and Climate Change Canada – Winnipeg, MB

Ute Holweger - (204) 983 – 9832 (office)
(204) 984 – 6683 (fax)
(204) 294 – 5128 (cell)

Environment and Climate Change Canada – Regina, SK

Patrick Cherneski - (306) 564-4450 (office)
(306) 807-8563 (cell)

Environment and Climate Change Canada – Regina, SK

Girma Sahlu - (306) 564 – 4457 (office)

APPENDIX D

HYDROLOGY COMMITTEE, AQUATIC ECOSYSTEM COMMITTEE, WATER QUALITY COMMITTEE; AND OUTREACH AND ENGAGEMENT COMMITTEE MEMBERSHIP LIST

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**International Red River Board
Hydrology Committee Membership:**

| Name | Agency | Address | Phone # | E-Mail |
|----------------------|--|--|--|--|
| Mark Lee | Manitoba Agriculture and Resource Development | 200 Saulteaux Cres. Winnipeg, MB R3J 3W3 | (204) 945-5606 (o) (204) 391-1623 (c) | mark.lee@gov.mb.ca |
| Jason Vanrobaeys | Agriculture and Agri-Food Canada | 2701 Grand Valley Road, P.O. Box 1000A R.R. #3 Brandon, MB R7A 5Y3 | (204) 578-6637 | |
| Dr. Haitham Ghamry | Fisheries and Oceans Canada | 501 University Crescent Winnipeg, Manitoba R3T 2N6 | (204) 983-5206 | Haitham.Ghamry@dfo-mpo.gc.ca |
| Bruce Davison | National Hydrological Services Environment and Climate Change Canada | 11 Innovation Blvd Saskatoon, Saskatchewan S7N 3H5 | (306) 975-5788 | bruce.davison@canada.ca |
| Steven M. Robinson | U. S. Geological Survey | 821 East Interstate Avenue Bismarck, ND 58503 | (701) 250-7404 (o) (701) 595-9153 (c) | smrobins@usgs.gov |
| Vacant | North Dakota State Water Commission | 900 E Boulevard Avenue Bismarck, ND 58505 | (701) 328-2756 | |
| Dan Thul | Minnesota Dept of Natural Resources | 2532 Hanna Ave. Box, 9 Bemidji, MN 56601 | (218) 308-2463 | dan.thul@state.mn.us |
| Randy Gjestvang | North Dakota State Water Commission | 1120 28th Avenue N., Suite C Fargo, ND 58102 | (701) 282-2318 (o) (701) 390-3578 (c) | rgjestvang@nd.gov |
| Rebecca Seal-Soileau | US Army Corps of Engineers | 180 East Fifth Street, Suite 700 Saint Paul, MN, 55101 | (651) 290-5631 | Rebecca.s.soileau@usace.army.mil |

**International Red River Board
Aquatic Ecosystem Committee Membership:**

| Name | Organization | Phone | Email |
|-----------------|--|-----------------------|-------------------------------|
| Patricia Ramlal | Fisheries and Oceans Canada | 204-983-5173 | Patricia.Ramlal@dfo-mpo.gc.ca |
| Brian Caruso | US Fish and Wildlife Service | 303-236-4304 | Brian_caruso@fws.gov |
| Luther Aadland | Minnesota Department of Natural Resources | 218-739-7576 ext. 235 | luther.aadland@state.mn.us |
| Todd Caspers | North Dakota Game and Fish Department | 701-739-6869 | tcaspers@nd.gov |
| Eva Enders | Fisheries and Oceans Canada | 204 984-4653 | Eva.Enders@dfo-mpo.gc.ca |
| Amanda Hillman | Minnesota Department of Natural Resources | 218-739-7576 x 276 | amanda.hillman@state.mn.us |
| Geoff Klein | Manitoba Sustainable Development, Fisheries Branch | 204-945-5206 | Geoff.Klein@gov.mb.ca |
| Aaron Larsen | North Dakota Department of Environmental Quality | 701-328-5230 | allarsen@nd.gov |
| Jeff Long | Manitoba Sustainable Development, Fisheries Branch | 204 945-7801 | Jeff.Long@gov.mb.ca |
| Doug Watkinson | Fisheries and Oceans Canada | 204-983-3610 | Doug.Watkinson@dfo-mpo.gc.ca |
| Jamieson Wendel | Minnesota Department of Natural Resources | 218-846-8340 | jamison.wendel@state.mn.us |

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**International Red River Board
Outreach and Engagement Committee Membership:**

| Name | Organization | Phone | Email |
|----------------------|---------------------------------------|--------------|----------------------------------|
| Ute Holweger | Environment and Climate Change Canada | 204-983-5897 | Ute.Holweger@canada.ca |
| Mary Scherling | Red River Basin Commission | | ScherlingM@casscountynd.gov |
| Gavin van der Linde | Red River Basin Commission | | gavin.vanderlinde@gmail.com |
| Ted Preister | Red River Basin Commission | 701-356-3183 | ted@redriverbasincommission.org |
| Sarah Lobrichon | International Joint Commission | 613-992-5368 | lobrichons@ottawa.ijc.org |
| Rebecca Seal-Soileau | US Army Corps of Engineers | 651-290-5756 | Rebecca.S.Soileau@usace.army.mil |
| Girma Sahlu | Environment and Climate Change Canada | 306 564-4457 | Girma.Sahlu@canada.ca |

**International Red River Board
Water Quality Committee
Membership:**

| Name | Organization | Phone | E-mail |
|---------------------------------|--|----------------|--|
| Jim Ziegler, (Co-chair) | Minnesota Pollution Control Agency | (218) 846-8102 | Jim.Ziegler@state.mn.us |
| Nicole Armstrong, (Co-Chair) | Manitoba Agriculture and Resource Development | (204) 945-3991 | nicole.armstrong@gov.mb.ca |
| Aaron Larson | North Dakota Department of Environmental Quality | 701-328-5230 | alarsen@nd.gov |
| Ted Preister | RRBC/Moorhead | (218) 291-0422 | ted@redriverbasincommission.org |
| Rochelle Nustad | USGS | (701) 775-7221 | ranustad@usgs.gov |
| Iris Griffin | Environment and Climate Change Canada | (204)-984-5694 | iris.griffin@canada.ca |
| Keith Weston | Red River Retention Authority | | rrra@ideaone.net |
| Paul Klawunn | Environment and Climate Change Canada | (905) 336-4965 | Paul.klawunn@canada.ca |
| Michelle Harland | Environment and Climate Change Canada | (204) 983-1816 | Michelle.harland@canada.ca |
| Jason Vanrobaeys | Agriculture and Agri- Food Canada | | Jason.Vanrobaeys@AGR.GC.CA |
| Kris Jensen | US EPA | (313) 312-6237 | jensen.kris@epa.gov |

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